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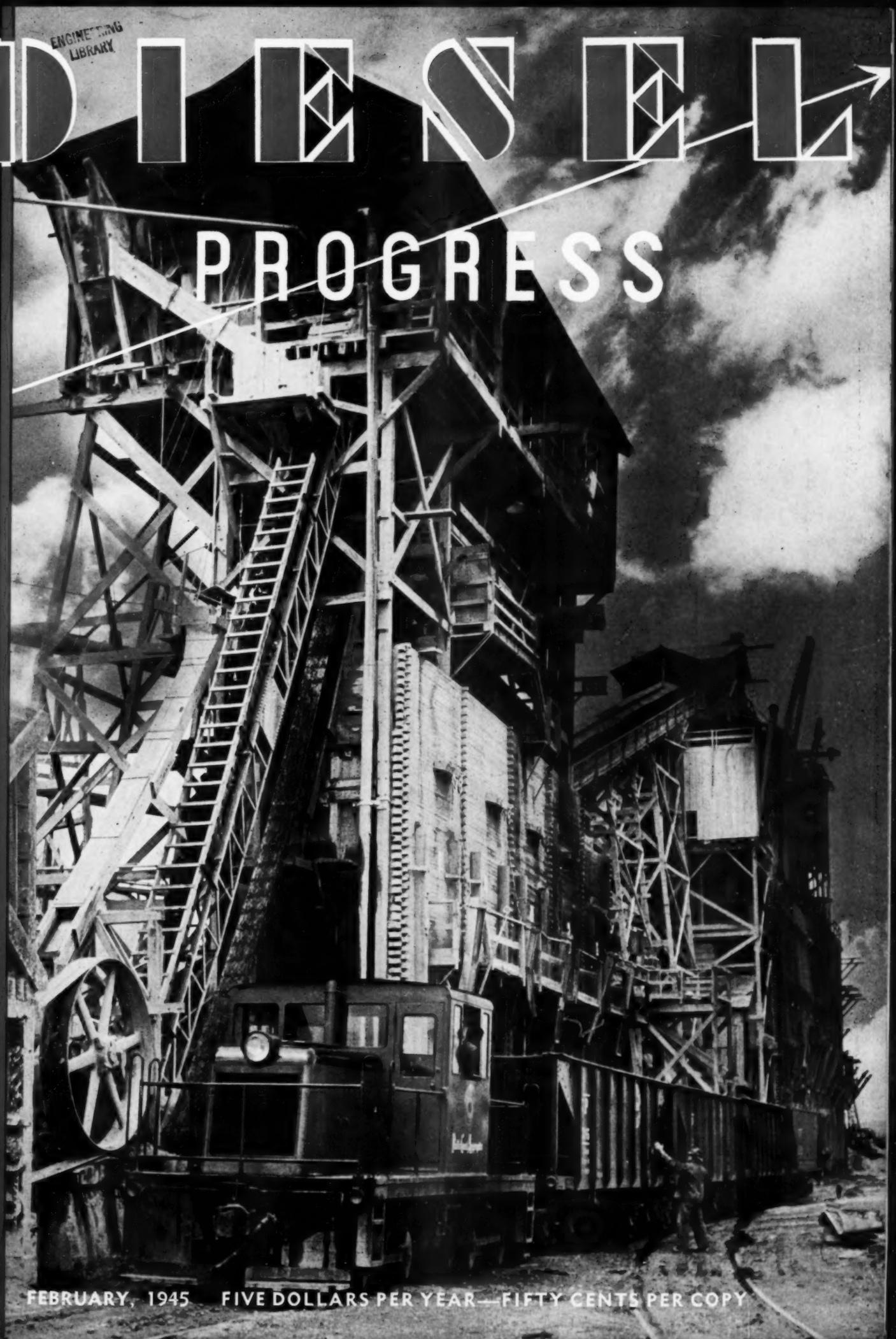

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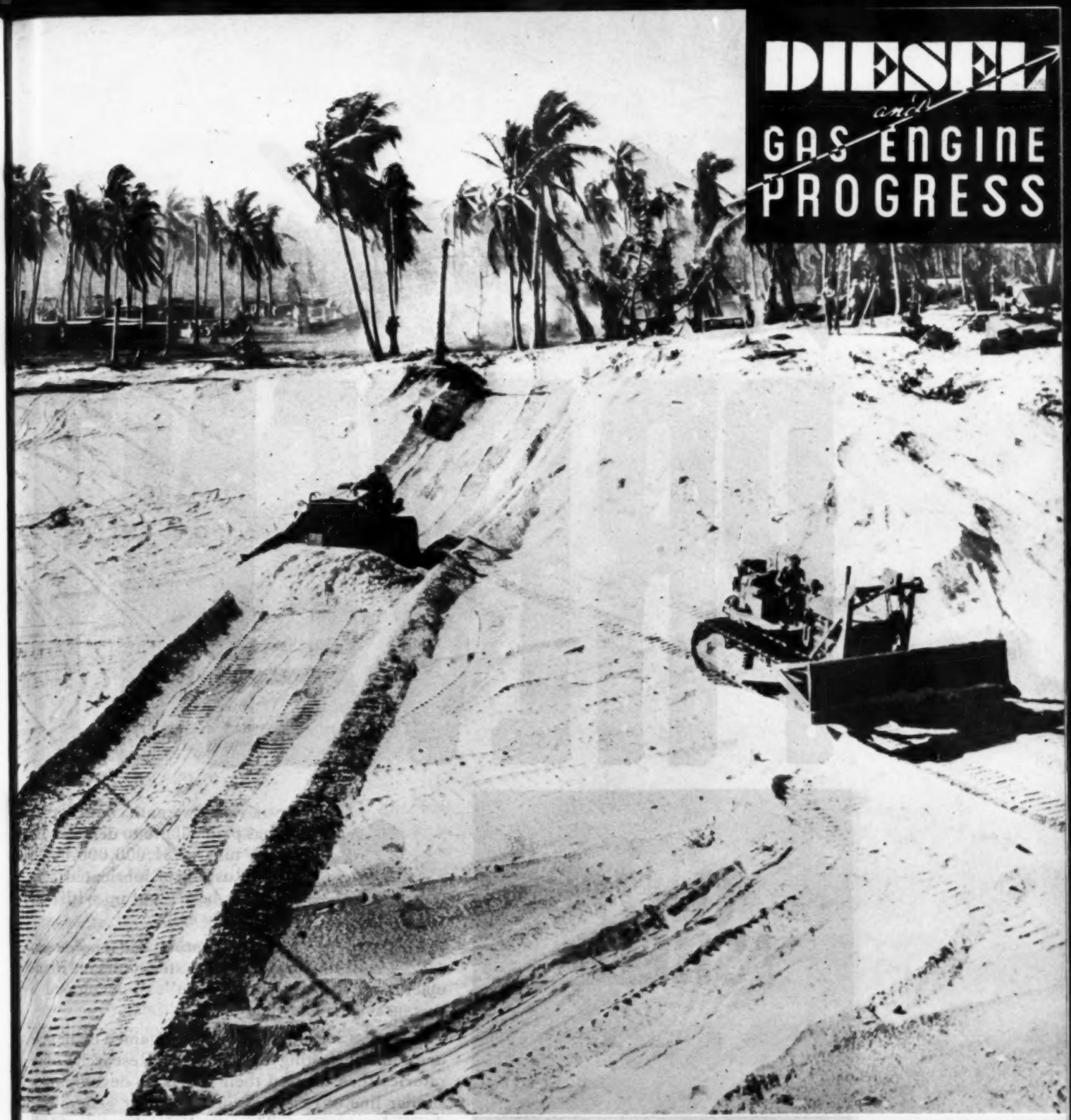

DIESEL and GAS ENGINE PROGRESS

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REX W. WADMAN
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FRONT COVER ILLUSTRATION: A 45-ton G.E. Diesel-electric switcher, powered with a Cummins, 150 hp. Diesel, spotting cars at the loading bins of the Pacific Coast Aggregates Works, Pleasonton, California.

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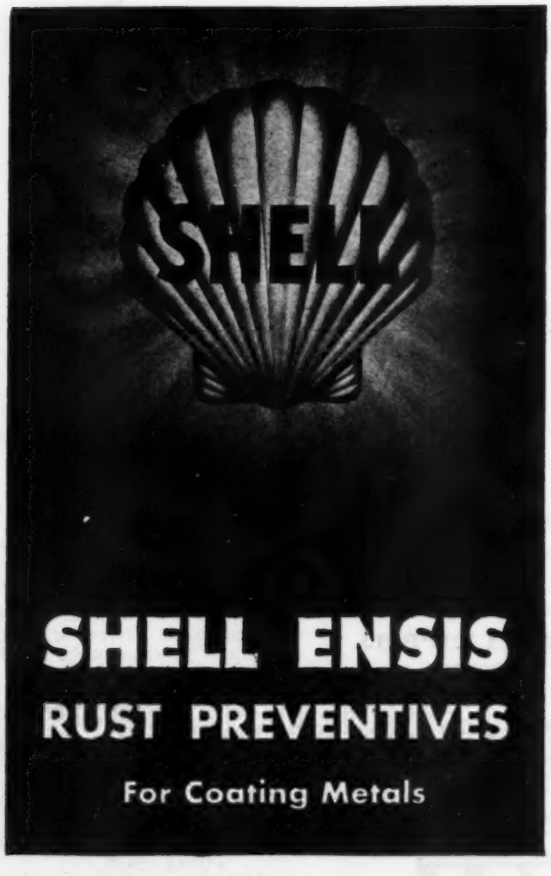

FOR YEARS AMERICAN INDUSTRY has paid tribute to demon rust to the tune of $1,000,000,000 a year. Rusting of lubricated surfaces has been "put up with" as a necessary evil.

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The new Shell Tellus Oils are not designed to *remove* rust. They will not eliminate all existing rusting conditions that may be present in your machines. But where moisture is a factor, the new Shell Tellus Oils, because of the special rust-inhibiting qualities built into them, afford unequaled protection against the formation of rust . . . and without the sacrifice of other valuable

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The new Shell Ensis Rust Preventives cover a complete line of oils, coatings and compounds. They are available in a number of grades, designed to give protection against the dangers of exposure, which range from the extreme effects of rain and snow during outdoor storage, to the mild humidity conditions encountered in the factory between machining operations. The protective coatings formed by Shell Ensis Rust Preventives graduate from the extremely thin, transparent oil films that need not be removed, to the heavy, abrasion-resistant coatings which will withstand severe weathering conditions over long periods of time.

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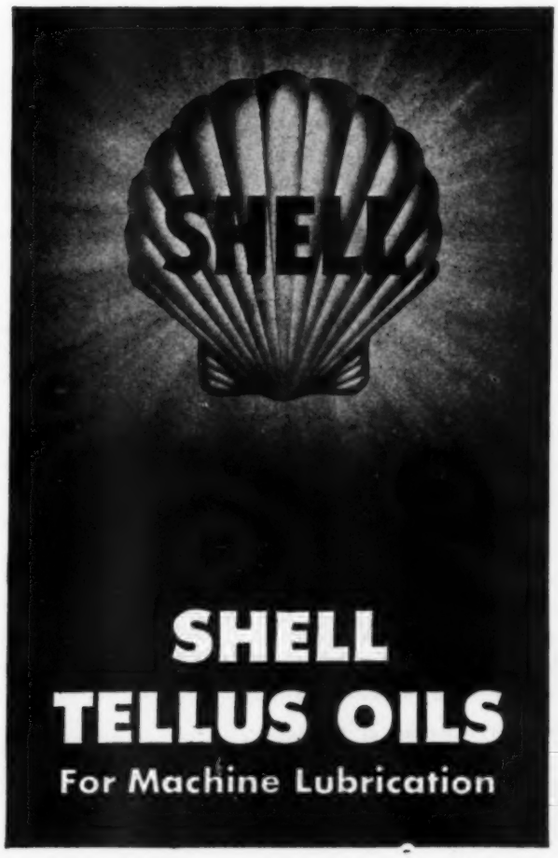
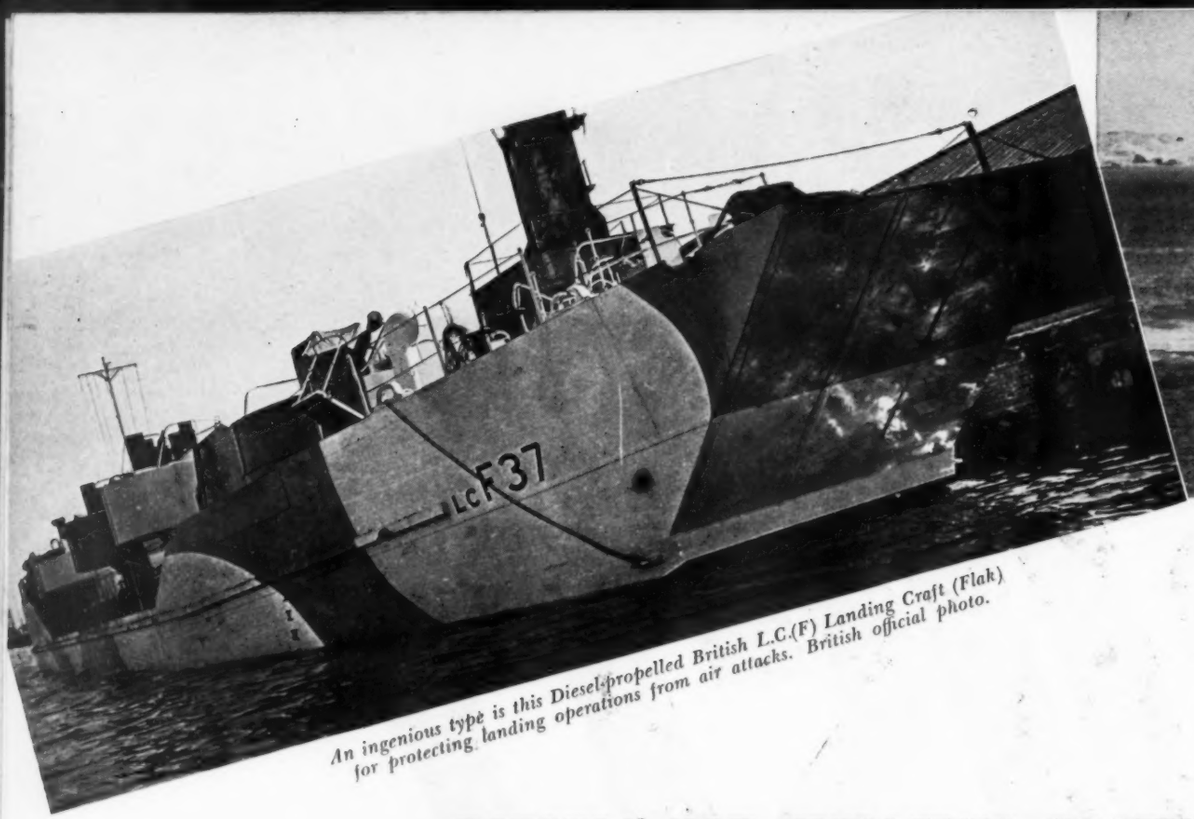




An ingenious type is this Diesel-propelled British L.C.(F) Landing Craft (Flak) for protecting landing operations from air attacks. British official photo.

DIESELS FOR INVASION CRAFT

By CAPTAIN ERNEST WATKINS*

THE Diesel engine now used in British Tank Landing Craft (L.C.T.) is an interesting example of development and improvement in engine design and factory methods, brought about very largely by the pressure of urgency. What looked like difficulties have, in the end, been turned by skill and intelligence into aids to full-scale supply.

In the summer of 1940, Britain's Admiralty started a search for a suitable engine to power whatever craft were ultimately evolved for the return to Western Europe. By a series of happy chances, the evacuation of men from Dunkirk had been successfully carried out, mainly by civilian craft very ill-adapted to military purposes. But these craft had not been able to bring away from the beaches any heavy military equipment at all.

One thing was clear, they would be useless in an invasion: useless as carriers of tanks or vehicles or artillery. Whatever craft was designed would need a reliable and powerful engine.

At the same time, a firm of marine engine builders were, on the instructions of the Ministry of Supply, working out a specification for a Diesel engine powerful enough to drive a heavy tank. They had completed their specification, but by then the situation had demanded changes in the tank itself and their engine was no longer suitable. In the end, it was the Admiralty that adapted the engine for landing craft instead of the War Office for tanks.

In design, the engine is not revolutionary—it is a straightforward fuel injection engine with 12 cylinders, 2 Vee in banks of 6 a side, developing 500 hp. at 1300 rpm. with a reserve factor of some 10 per cent as designed. What is unique is the production lay-out which the engineering firm planned to meet the situation.

Before the war, it was an accepted practice in Britain that manufacture and assembly of an engine should be done in the same factory, since it was most economical to build the assembly shops round the casting and forge sections. But this could not be done with this engine as there was neither the time nor the manpower available to build the new and very extensive plant that would be necessary to undertake the whole programme.

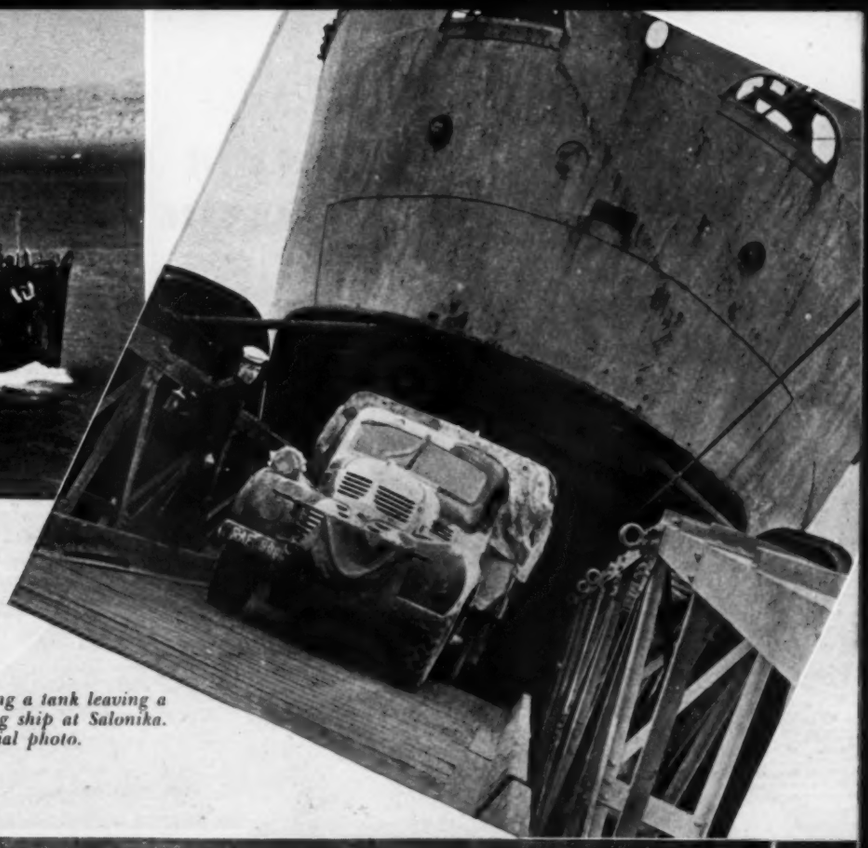
It was fortunate that the engine assembly was designed in such a way that the whole could be broken down into sub-assemblies and parts which could be made piece-meal all over Britain.

It was no easy task. The machining tolerances in Diesel engine manufacture are of the order of one-thousandth of an inch and to get perhaps a dozen or so different works producing parts that can still be assembled with these tolerances is almost revolutionary. The experiment worked. The Ministry of Supply established an assembly centre and put it under the management of one firm. Later, another firm which previously had produced nothing but motor-cars was also brought in and today these two factories do nothing but assemble, and test new engines and recondition the old. Every part is made elsewhere under the control of the Ministry of Supply. There are over 200 separate firms making these parts and probably about 16,000 workpeople are employed in some way or other to make them.

The engines have had a good opportunity to show their capabilities. Each L.C.T. is driven by twin screws, each operated by one of these engines. They went into the first landing craft that were used operationally, those at Dieppe in 1942 and they stood up to that test. Later, they assisted the Eighth Army to move from Egypt to Tunis by supplying it with its essential water along the North African Coast. Their next was the North African Invasion. For that, they sailed from Britain to the North African coast through the Bay of Biscay, the home of Atlantic storms, with their loads and many sailed back, some making more than one round trip to the Mediterranean. Others stayed

* *Of the British Army's Bureau of Current Affairs.*

One of the largest types is this LSD, Landing Ship, Dock. Official U. S. Navy photo.



View showing a tank leaving a tank landing ship at Salonika. British official photo.

in those areas and were joined by other newer companions for the invasion of Italy in 1943. They took the armies into the final attack on Western Europe. They are now maintaining these armies in the field. They will be ready to sail for the Pacific to deal with Japan.

All this has been done on the basis that they are not likely to be operated by fully trained sea-going engineers. The majority of engineers in landing craft are men who have come straight into the Navy, and are trained as operators rather than as engineers, so that the engines have to depend to a large extent upon their own merits.

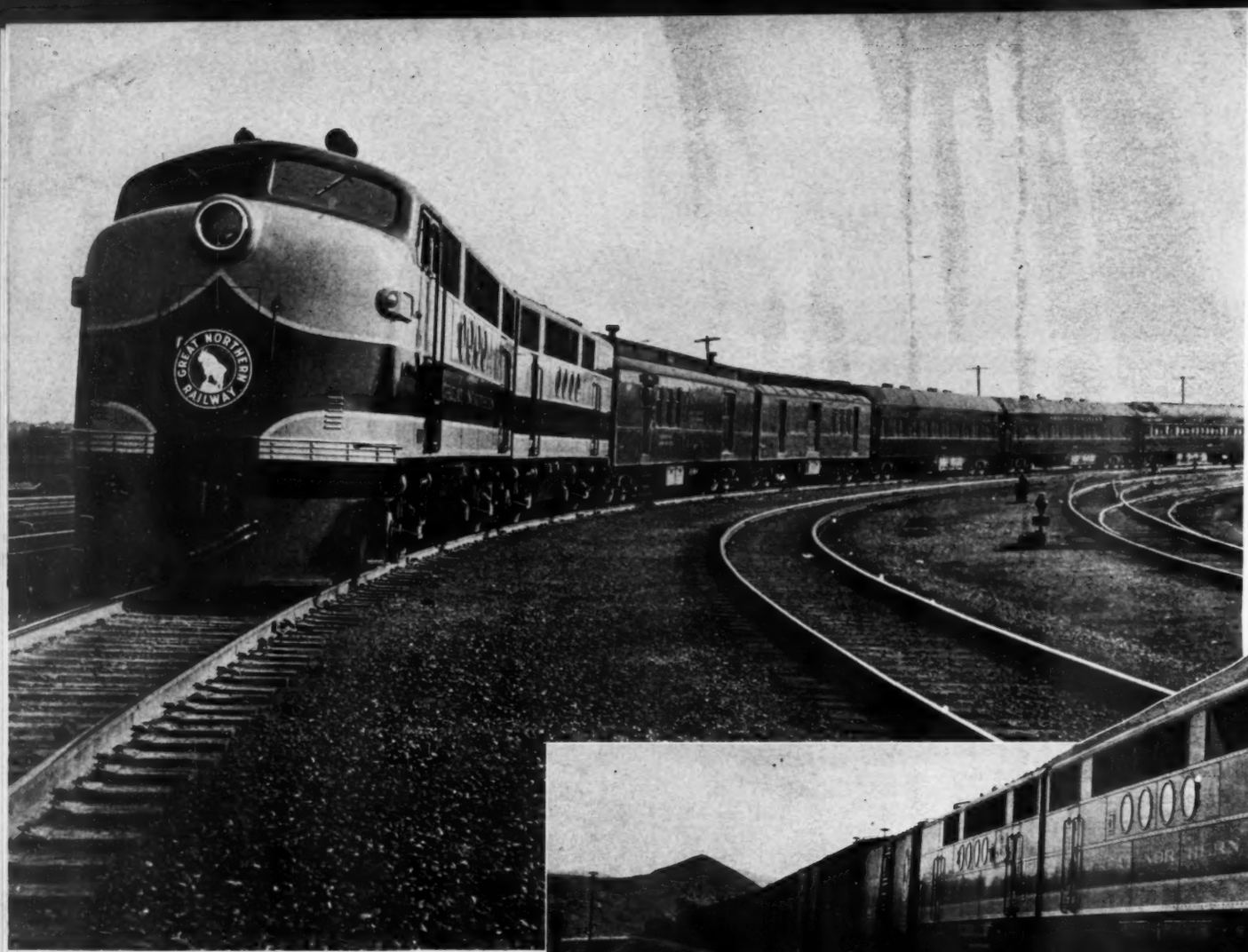
An illustration of how war modifies engineering practice is shown in the process employed for lining the bearings of the engine. The load on these bearings is too high for the normal white metal lining to be used. An alternative is an amalgam of copper and lead but which usually necessitates the crankshaft being of hard, high grade steel. Otherwise, the hard bearings would score the shaft. However, it has been found by giving the bearing face an additional coating of one-thousandth of an inch of lead, the bedding down process of the two bearing surfaces is completed before either surface is scored. The lead coating acts as a lubricant to overcome the initial friction during the running-in process.

Another interesting point is that to supply the new design of bearing in ample quantities, it was necessary to start an entirely new factory. In war time, factories go where the labor is. A factory in Scotland, formerly making carpets, had been closed as non-essential but was reopened immediately as an engineering shop and the girls who had once made carpets were, after the necessary specialist training, soon turning out main bearings for these engines.

Launching of a British landing craft is watched by the women who helped to build it. British official photo.

Production is now well organized but, early this year, a chance enemy raider seeking to escape anti-aircraft fire released the whole of his load of incendiaries on the parent factory. The load included a 1,000 kilogram phosphorus bomb which burnt out some storage bays.

It was an awkward situation if only for the fact that over 90 tons of finished parts came into that factory every week and supplies could not be stopped. Some work was transferred to the duplicate factory prepared against such an occasion until the parent factory was able to make more convenient arrangements. Meanwhile, the remaining accommodation in the parent factory became more crowded, but the completion of new and reconditioned engines fulfilled all requirements.



Above: The "Gopher," Great Northern's popular and fast train between St. Paul-Minneapolis and Duluth-Superior, pulled by two sections of a General Motors Diesel freight locomotive. Right: A 2700 hp. General Motors Diesel freighter on the Continental Divide above Butte, Montana.

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GREAT NORTHERN ROLLS UP 200,000 MAINLINE DIESEL MILES PER MONTH

Part I

By CHARLES F. A. MANN

Shown left on the map are the long, mainline routes, where ingenious and economical usage of light switch locomotives as road engines works wonders.

LEGEND

(A) Sioux City, Iowa-Willmar, Minnesota 450 mile daily round trip.
(B) St. Paul-Grand Forks-Duluth Triangle run (via Fargo and St. Cloud) longest light Diesel locomotive run in the world, 600 miles, daily, per each locomotive, pulling 4 trains, and filling in as switchers at smaller wayside stations.
(C) Fargo, N. D. to Devils Lake, via McVille, 316 mile round trip "Hotshot" local in 12 hours.
(D) Sauk Center to Bemiji, 312 mile daily round trip, one way freight, one way mixed.
(E) Stanley, N. D. to Grenora, 88 miles each way.
(F) Spokane to Colfax & Moscow 252 miles daily on freight trains, plus switching hours.
(G) Spokane Coeur D'Arlene—64 miles, plus heavy hours in industrial and yard work en-route

EDITOR'S NOTE: As this series of studies of leading American railroads and their application of Diesel prime movers progresses, it becomes increasingly obvious that Mainline Diesel locomotive power has passed most of its design, mechanical and technical hurdles and now the leading question in every Railroader's mind is the *economic application of Diesel.* We present herewith Part I of the brilliant "record from the Book" of the enterprising Great Northern Railway.

THE Great Northern Railway, headed by two of America's shrewdest operators, Frank Gavin, President, and C. O. Jenks, Operating Vice President, continues to be one of the greatest laboratories for motive power of any railroad in the world.

Calmly, without fuss or lost motion, this sprawling system goes ahead with a succession of ingenious Yankee experiments, each paying its way as it goes along, in the re-powering of a whole railroad empire. Unafraid to try the unusual; the Great Northern is one of the very few systems to proceed with elaborate tests and on-line, daily-grind type of experiments in the field of coal and oil powered steam engines; Diesels of every size and electric power out beside Grand Coulee Dam where electric locomotives can get the best break, if ever there was a region where low-cost electricity might work out to advantage, comparatively.

By the end of 1944, the G.N. had 13 big 5400 hp. General Motors Diesels at work between Whitefish and Havre, Montana, across the tough Continental Divide at Glacier National Park. Two more are due in 1945. It all began, as was reported in DIESEL PROGRESS two year ago, when the Great Northern tried out a 4050 hp. 3-unit, low geared Diesel helper on the Walton-Summit Hill, 17 mile Continental Divide crossing. In 1941 this famous Diesel went to work pushing 5000 ton freights uphill; coasting back light, then right back uphill, sometimes 7 round trips in a single day!

By the end of 1944 the Great Northern's brash experiment at making light, fast road engines out of 1,000 hp. Diesel switchers, had proved so sound that the company runs some 2770 miles per day of this type of light passenger, mail, way freight and local service. Former locomotive costs with aged steam power ran around 50-65 cents per mile. Now it runs from 18.47 to 22.73 cents per mile with Diesel, or enough saving in power alone to turn most of these little prairie runs from red to a distinct, lovely shade of black!

Eleven switchers now have passenger controls, high speed gearing, heating boilers and all, and romp over three states on runs the company had marked for oblivion until Diesels came along. Over the Continental Divide, from Great Falls to Butte, Diesel No. 200 has proved a lifesaver for a crooked mountainous line, with innumerable bridges, narrow tunnels and crumbling water facilities, and now the company has ordered 5-4050 hp., 3-unit freight Diesels to do most of the postwar business on the Butte Division, thus abandoning steam entirely!

Our readers will remember how this lone 2700 hp. General Motors Diesel raised the tonnage from 900 to 1200; speeded up the run by about 50% and eliminated a $1,000,000 line and facility change program if heavier steam power was to be purchased. Now it looks like Montana will be a 100% Diesel operation as soon as the WPB lets go!

Fifteen 5400 hp. freightrs; 5-4040 hp. freighters and lastly, in December came word the company had placed orders for 5 spectacular completely new 11-car streamlined passenger trains, each to have a 2-unit, 4,000 hp. General Motors Diesel passenger locomotive, to replace at one fell swoop the entire fleet of 7 present heavyweight, steam powered Empire Builders, at a cost of $7,000,000!

Started as a temporary expedient, the Gopher pair of trains between St. Paul, Minneapolis, and Duluth-Superior, with their converted 2700 hp. freight Diesels, have since proved the most popular, the fastest and best money-making

trains between the two Twin Cities operated by any of the three railroads!

"Conversion" in Gopher language, consisted of merely adding a heating boiler and changing gears to 19:58 ratio, and the company kept on thinking of the whole scheme as merely a war-time expedient to squeeze the last available ounce of work out of its motive power. The idea was to temporarily make use of two 2700 horse-power standard model General Motors Diesel freight locomotives to haul the Gopher on its fast 3½ hour afternoon run to Duluth, each way, and bring the Diesel back again as a busy night-local freight operation. But the thing has worked so well, that by now the Great Northern has turned it into a workable, sound piece of railroad economics, and automatically did the laboratory work to prove that there need be no difference between high speed passenger power and freight power on anybody's Diesel railroad.

The Great Northern now has in service the following:

13—5400 hp. General Motors Diesel freighters
3—2700 hp. General Motors Combinations
1—4050 hp. General Motors Helper at Glacier Park
11—Road switchers, 7 General Motors and 4 Alcos.
43—Diesel switchers, ranging from 360 to 1000 hp., of various makes.

The Great Northern now has on order the following:

5—4000 hp. Streamlined General Motors 90 mph. Passenger Diesels for the New Empire Builders
5—4040 hp. General Motors Diesel freighters (3-unit) for Montana use
2—5400 hp. General Motors Diesel freighters to complete its Havre-Whitefish-Spokane-Wenatchee mainline Diesel freight operation.

And by publication date, possibly more Diesel switchers.

Out of the various assorted experiments begun by this progressive company in 1941, have thus emerged some of the most unusual and profitable applications of Diesel locomotive power to be found on any other railroad in the world.

Copying nobody; falling for neither emotional salesmanship nor the dreary voice of yesterday's prophets, this company has pioneered with a peculiar brand of initiative, cold logic and a wholesome corporate attitude drawn from the Main Street little business man: "It must earn its daily share of profit or that Line must be discarded for we cannot afford to keep merchandise on hand just to decorate our shelves."

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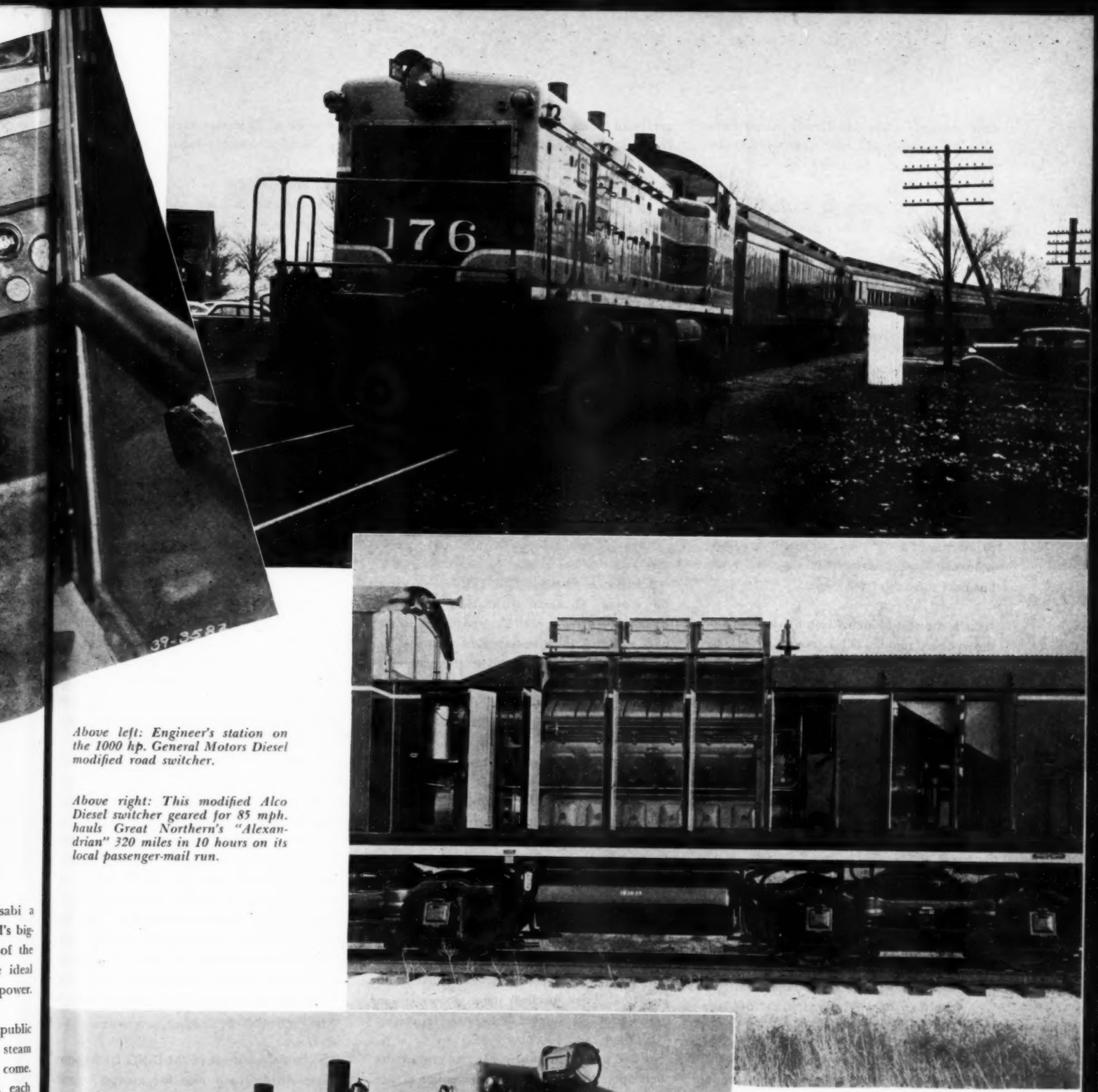
This becomes more significant when one remembers the Great Northern is in reality three great, profitable railroad operations rolled into one. And this has resulted in a higher percentage of total annual revenue from people and goods originating on its own system than any other railroad west of the Mississippi. The first segment is the fabulous Mesabi Division, a completely integrated, heavy-duty, low grade and curvature railroad serving the fabulous Iron Range country of Minnesota. 25,000,000 tons of ore have rolled down the three-branched line from Kelly Lake yards to Duluth-Superior, to the vast Allouez Ore Dock on Lake Superior, likewise a Great Northern enterprise. Reverse movement from Lake-borne coal-ballasted Northbound ore boats, gives the Mesabi a front-door contact with one of the world's biggest coal piles. Seasonal characteristics of the ore movement, make this one spot the ideal to test to the end, coal fired mallet steam power.

This, plus economics, politics and sound public relations will probably keep Mesabi a steam railroad operation for some time to come. 18,500 ton trains, the world's heaviest, each with 150 cars of ore, are a daily standard. Yet it is wise to not forget a 5400 hp. 4-unit General Motors Diesel out-pulled and out-maneuvered the big 2-8-8-2 Mallets on the same load, on a test run last year. No other freight run on the globe matches these hour-apart 1½ mile long tonnage ore trains on the Mesabi. And Mesabi gave Frank Gavin to the G.N. One almost wonders if a lifetime spent with coal, steam and iron ore wouldn't make a railroad presi-



Above left: Engineer's station on the 1000 hp. General Motors Diesel modified road switcher.

Above right: This modified Alco Diesel switcher geared for 85 mph. hauls Great Northern's "Alexandrian" 320 miles in 10 hours on its local passenger-mail run.

View of the modified, 1000 hp. Electro-Motive Diesel switcher with engine hood up and doors open to show arrangement of power plant.

The Great Northern has 11 of these modified Diesel switchers, 7 General Motors and 4 Alco, piling up 2770 mainline miles per day.

dent positively allergic to Diesels in any form —but it obviously did not, what with 51,000 Diesel hp. on order for 1945!

Between St. Paul and Puget Sound runs what the public thinks is the "Great Northern."

Here, enjoying in 1945 the benefits of a wise engineering layout and free of the stultifying pressure of clumsy land grants—a part of the policy laid down by James J. Hill, this northernmost transcontinental line (U.S.) does the daily battle of competition on a wide, varied, busy transportation front. Three segments of the 1800 mile span of tracks are the scenes of G.N. Diesel operation. Minnesota-Dakota's flat farm country, prosperous little farm communities spotted everywhere, form the backdrop of the 2 road-switcher's novel adaptations. After two years plugging, the idea has proved sound, and all runs powered thusly have turned from red to black, and hundreds of communities enjoy train-mail-express service that was cast for the bus lines three short years ago.

Next is the vast Montana country, midships in the system's routes. Oil is mounting in economic importance, pushing coal back to Fernie, B.C. and Middle and South Montana. The oil boom is on in Montana. So, the G.N. runs practically everything west of Havre with oil, cousin of Diesel fuel oil too. Montana's homes and stores may be heated with coal, but the G.N. calmly hauls coal trains with oil burning locomotives, simply as a sound economic proposition! Water supply problems in arid eastern Montana; long hills to climb; sharp curvature, light steel on secondary tracks, set the stage for Diesel as on most no other system, save the arid desert plateau midway in the Santa Fe system. Here again, external circumstances rule in favor of Diesel even if it cost more for each mile of operation than steam . . . which, of course, it doesn't.

From Havre, Montana, across to Whitefish, and down to Great Falls, Butte, Billings the scene is already laid for what appears to be a 100% Diesel operation in the not too far distant future. A 5,000 ton freight train of 99-120 cars is standard daily practice on the G.N. low-grade, easy-curve, low altitude Main Line. The 5400 hp. Diesel freight locomotive has proved its mettle. As traffic varies, these runs have been extended frequently past Whitefish to Spokane and even to Wenatchee, at the foot of the Cascade Mountain electrified zone. In fact with only 13 of the big units in service, hardly a week goes by but what a solid trainload of luscious Wenatchee apples doesn't pull out of appleyard siding and go straight through to Havre, Montana, in 18 hours time!

Out of Spokane, the old SCAP line was clipped of its electrification and now the entire little 160 mile branch to Colfax, Moscow and Coeur' D'Alene is 100% Diesel operated with 3 road-switchers. Economics and not mechanics Dieselized this entire branch. "Cheap" hydroelectric power proved twice as costly per mile as Diesel.

A two-forked North-South route, branching down from Spokane and from Vancouver, B.C., join at Wishram, Wash. in the Columbia River Gorge, and by a system of intricate subsidiaries, leased lines and affiliates, gives the whole Pacific Coast an independent through North-South competitive rail route from Canada to San Diego. This is the G.N.'s postwar ace in the hole, and likely to upset the whole Pacific Coast rail monopoly—especially if the Klamath Falls gateway is forced to open for mail and passengers and the bus empire of the G.N.'s chief competitor is smashed into independency by the courts. Thus the Great Northern's very geographic spread is both its strength and weakness, weakness if its management ever goes to seed and becomes hidebound in the matter of railroad mechanics and technology. A wiseacre railroad president once told this writer that the G.N. was a "Chromium Plated Skeleton"!! Meaning of course, its bones were imperishable and there was no waste fat to bend it down.

Astute Diesel locomotive enthusiasts sit up and listen when the Great Northern speaks about locomotives—locomotives of any kind. For they know that its management is open minded—cool and calm about the whole thing, and Diesel's good and bad points get equal scrutiny and fair statistical reports for the record. This freedom from prejudices embraces G.N. policy from bond issues to planting of petunias and washing its wayside stations down annually with soap and water to cheer up a gloomy citizen waiting for old Number 28 to smoke into sight!

No lost motion anywhere. It has one of the best operating records for steam power of any U. S. railroad, and if given time, will somehow turn up with the most efficient Diesel operating records too. They are just that way. Long proud of getting more ton-miles per man-hour of labor than practically any other railroad on the Continent, the G.N. walks into the Diesel era with its eyes wide open. Forty years experience with electric power; 55 with steam, 10 with Diesel, it proceeds unhurried to that goal of all railroads, how to get there FIRST, with the MOST, at the LOWEST tariff charge to the consumer of its service—the public, and avoid repetition of mistakes learned the hard way.

Some financiers say the G.N. will be one of 4 U. S. railroads to stand up and lick the oncoming age of air. So far they show unique ability in this direction. Obviously with a $5,000,000 order for Diesel locomotives in the mill, the G.N. doesn't think it is going haywire on Diesel.

Enough of a record has piled up to now make good reading for those who wonder "What Happened."

Before tackling this story, the writer climbed aboard 1st No. 460, 108 cars drawn by a big 5400 hp. 4-unit General Motors Diesel. Leaving Whitefish, this 4600 ton train of 54 loads and 54 empties rolled up to Walton where the 3-unit low geared Diesel helper was cut in, then to Blackfoot, and 2 hours later into Shelby. A stopoff then aboard No. 424 with 4990 tons and 85 cars, and less than 3 hours we rolled into Havre, eastern terminus of the mainline Diesel run. Then, a few days later, we went up to Duluth in the cab of the Gopher, with its 2700 hp. modified General Motors Diesel freight locomotive, that turns around again and comes back on the midnight freight from Duluth. Then up the Iron Range route in the cab of a slow, 13 mile per hour coal fired mallet. Near the top we spied the little Road Switcher on No. 36 from Grand Forks, racing into Duluth in the early morning. Everywhere everybody who operates the G.N. seemed glad to welcome the Diesels. The crews, starting off with Engineer Frank Richter out of Whitefish, scholarly W. R. White, 36 year veteran out of Shelby and 43 year veteran engineer H. Linden on the Gopher who has operated Diesels since 1941, all had some peculiar brand of praise for their new engines, and thought warmly of the company for giving them comfort, more power and speed and fewer road headaches.

The far-flung picture of the G.N.'s Diesel operations divides itself into five groups for our tabloid Survey: The Walton Helper; the Road-Switcher fleet; the Butte operation; the Kalispell Diesel operation and the Gophers.

Impressively, we found the picture so little changed from when the plan was effected in 1941, so few shifts in power, that it can be nothing but a tribute to sound engineering from the start on the part of the company. Part II, A Look at the Record, will appear next month.

Bigge rolls away with an 18-ton Navy rescue boat behind his Peterbilt tractor with 150 hp. Cummins Diesels.

BIGGE

THE BIG BAGGAGE MAN

THE Bigge Drayage Co. of Oakland has been asked to perform every transportation miracle in the book, but when Naval authorities asked them to transport an 18-ton, 45-foot Navy rescue boat from Alameda to Pyramid Lake, Nevada . . . and to safely launch it in that lake . . . officials of the company thought they were having the book thrown right in their lap—with supplements attached.

Used to the "impossible," however, the Bigge gang put on their quick-thinking helmets and set to work solving their latest problem. Of course it was a rush job, with emphasis on the "rush." In the first place, they knew the highways leading to and over the Sierra Nevadas like the sidewalks to their own doorways, and they knew many of those mountain turns had an exasperating habit of meeting themselves coming back.

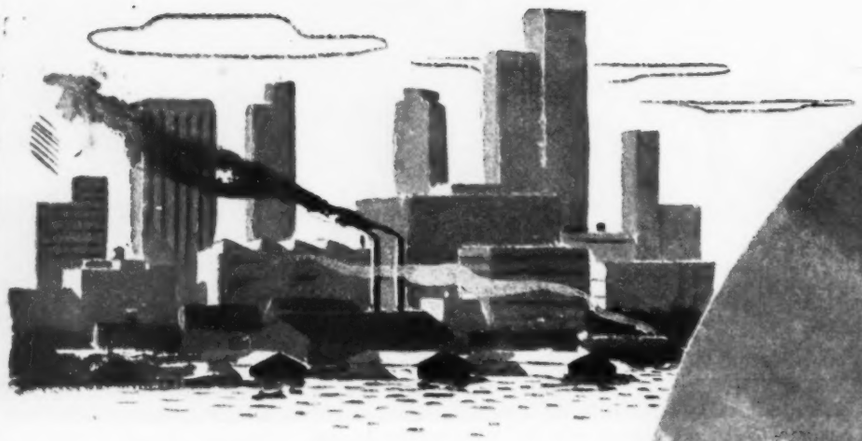
Special permission from the Interstate Commerce Commission to haul the big boat over the highways—a license that body doesn't keep on file, never having considered a highway an amphibious thorofare—undoubtedly would be granted because of the Navy's needs.

As far as the power to haul the boat was concerned, the Bigge men knew they would have to use something big in the way of a truck that had plenty of what it takes to lug a heavy load over steep mountain grades, hitting the inevitable holes that appear in hastily built detours, and which could take the tortuous twists and turns of Sierra roads. They knew they had the answer in their Peterbilt Diesel tractor, powered with a 150 hp. Cummins Diesel—one of the world's largest legal hi-way truck-tractors, equipped with a Timken rear end, the largest rear end made for legal highway width.

As for the immovable obstruction—well, there was only one thing to do about that. Use a pilot car with a bamboo pole, cut to the exact height of the load, lashed to the bumper in an upright position. If the pole failed to clear an obstruction, they would "lower away" and snake her under on rollers. There were small bridges to shore-up, weak culverts to by-pass using county roads and fire trails, and overhanging limbs to cut away before the crew could approach the shore of Pyramid Lake and complete the all-important launching job.

Three days after the emergency call came from the Navy, the Bigge Drayage Co. had "sailed" their boat over its hazardous course. Now came the complex matter of launching. The Navy had built a 150-foot rock mole, but the distance was short by half for water depth to launch the rescue boat. The crew had anticipated nearly everything, though, and had brought a truck load of planking and cribbing and rigging tools with which they built a 150-foot rock-weighted underwater skidway and backed their boat and trailer to the "Bigge launching ways." Empty oil drums, another improvisation used for the strange launching, were lashed to the bow, the buoyancy of which would save their boat from an ignominious nose-dive in the mud. Then, with two anchors cast 200 feet ahead of the boat to hold the cables going back to the powerful winch mounted on the Peterbilt truck, and lashing additional drums as she was drawn foot by foot from her high trailer berth, she was pulled out to her own depth and floated clear of the bottom. All this took about eight hours after the truck and trailer drew up to the launching site, a record time for a job that observers and bystanders predicted would take three to four days.

Built to meet a

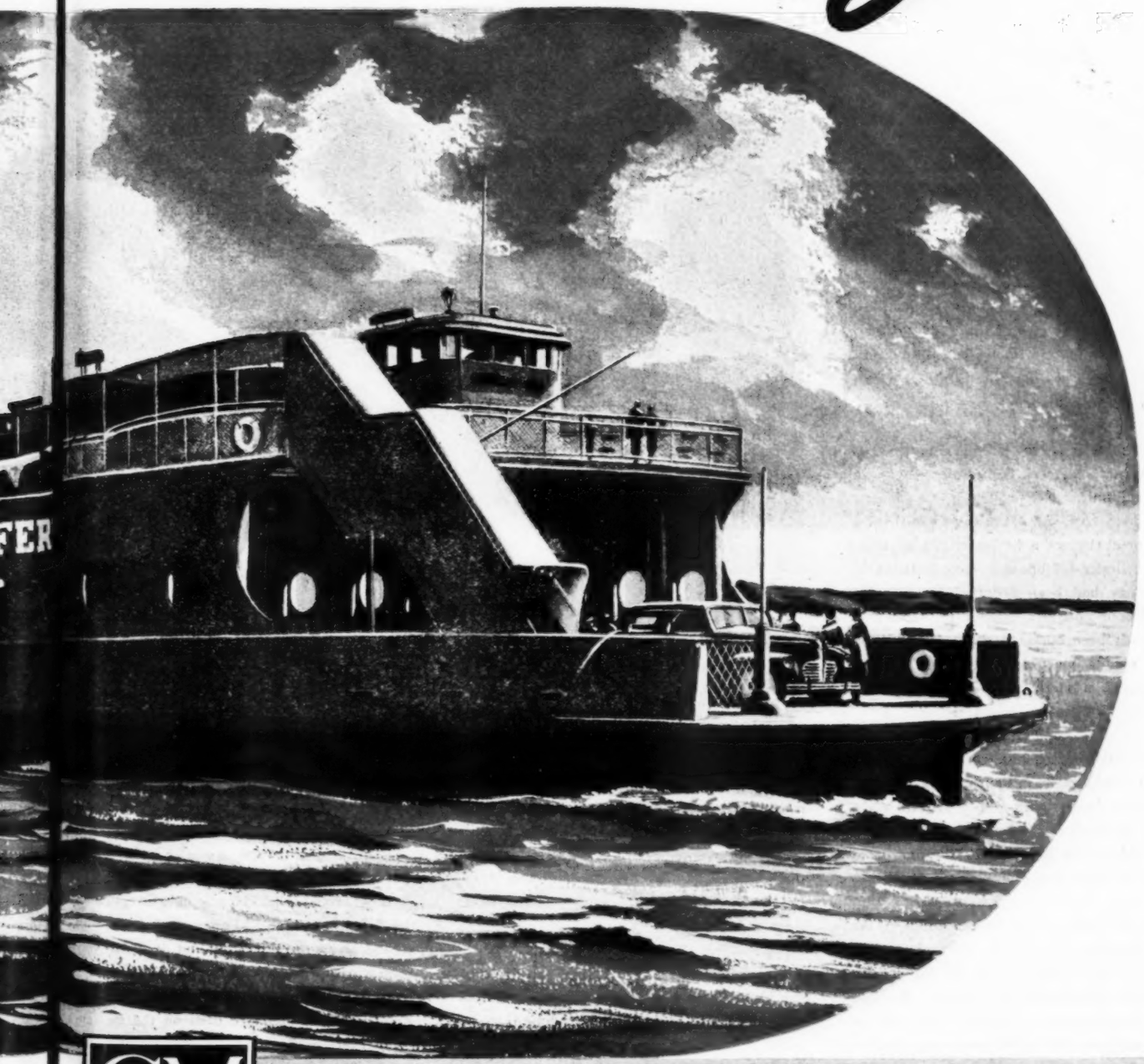


Diesel-Electric ferries are building a fine reputation for performance.

Diesel-Electric-drive ferries are building a fine reputation for performance. To pay their way these busy shuttling ferries have to keep steadily at their timetable job. It's forward and stop, back and stop, all day long. Scarcely any other installation demands so much in dependability, maneuverability, and ready response from the power plant. With their General Motors Diesel-Electric drive, these boats are setting imposing records of on-time, profitable performance.

KEEP AMERICA ST

...a Timetable Job



GM
GENERAL MOTORS
DIESEL POWER

ENGINES..150 to 2000 H.P. **CLEVELAND DIESEL ENGINE DIVISION,** Cleveland 11, O.

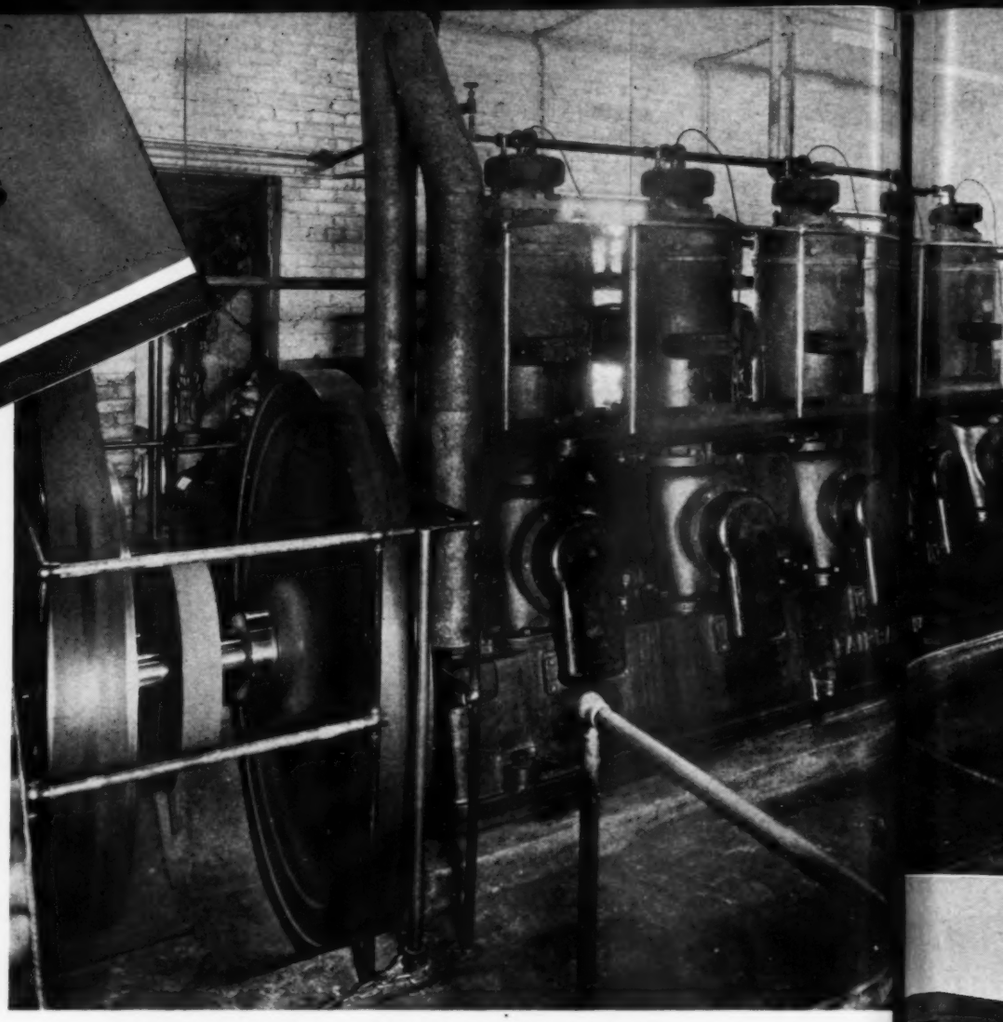
ENGINES.....15 to 250 H.P. DETROIT DIESEL ENGINE DIVISION, Detroit 23, Mich.

LOCOMOTIVES..... ELECTRO-MOTIVE DIVISION, La Grange, Ill.

STRONG • BUY WAR BONDS

ONE KNOCK IN EIGHTEEN YEARS

By T. J. MALONE



Six-cylinder, 300 hp. Fairbanks-Morse Diesel in the Commander Elevator at St. Louis Park, Minnesota.

LOOKING into a knock in Number 4 cylinder of one of the two Diesel engines installed in the terminal elevator of the Commander Elevator Company at St. Louis Park, Minnesota, a suburb of Minneapolis, led to some impressive findings bearing on the life and low operating and maintenance costs of Diesels.

The Commander elevator, comprised of 119 concrete bins and work house, has a capacity of 2½ million bushels of grain. It handles mostly wheat, corn and oats. Its two Fairbanks, Morse Diesel engines, a 4-cylinder 200 hp. unit, and a 6-cylinder 300 hp. unit, were installed in 1925. They had been acquired from a dismantled flour mill in a neighboring town and had already been operated about a year. The 200 hp. engine is a generating unit. The 300 hp. Diesel is a mechanical drive with silent chain.

These engines move about ten million bushels of grain yearly, eight million in and out and two million in turnover. They operate eight hours a day regularly, and at times ten hours or more, with heavy fluctuations, running from half to full load, and sometimes overload.

Despite the burden of constant operation, enforced shutdowns have been few and of short duration. They'd have to be, for the engines are not interchangeable as to service. If one is down, the whole plant is down. The 300 hp. engine operates the work house, the cleaners, the main conveyor belts and the four legs. The 200 hp. Diesel runs the fans and the rest of the conveyor belts, and furnishes the lights.

Though Number 4 cylinder, in the 200 hp. Diesel, had been noisy for a long time, the knock did not impair the efficiency of the engine, according to Harold Whelan, superintendent, but had become a nuisance. It was getting on nerves. So an inquiry was ordered last spring into the cause with a view to removing it.

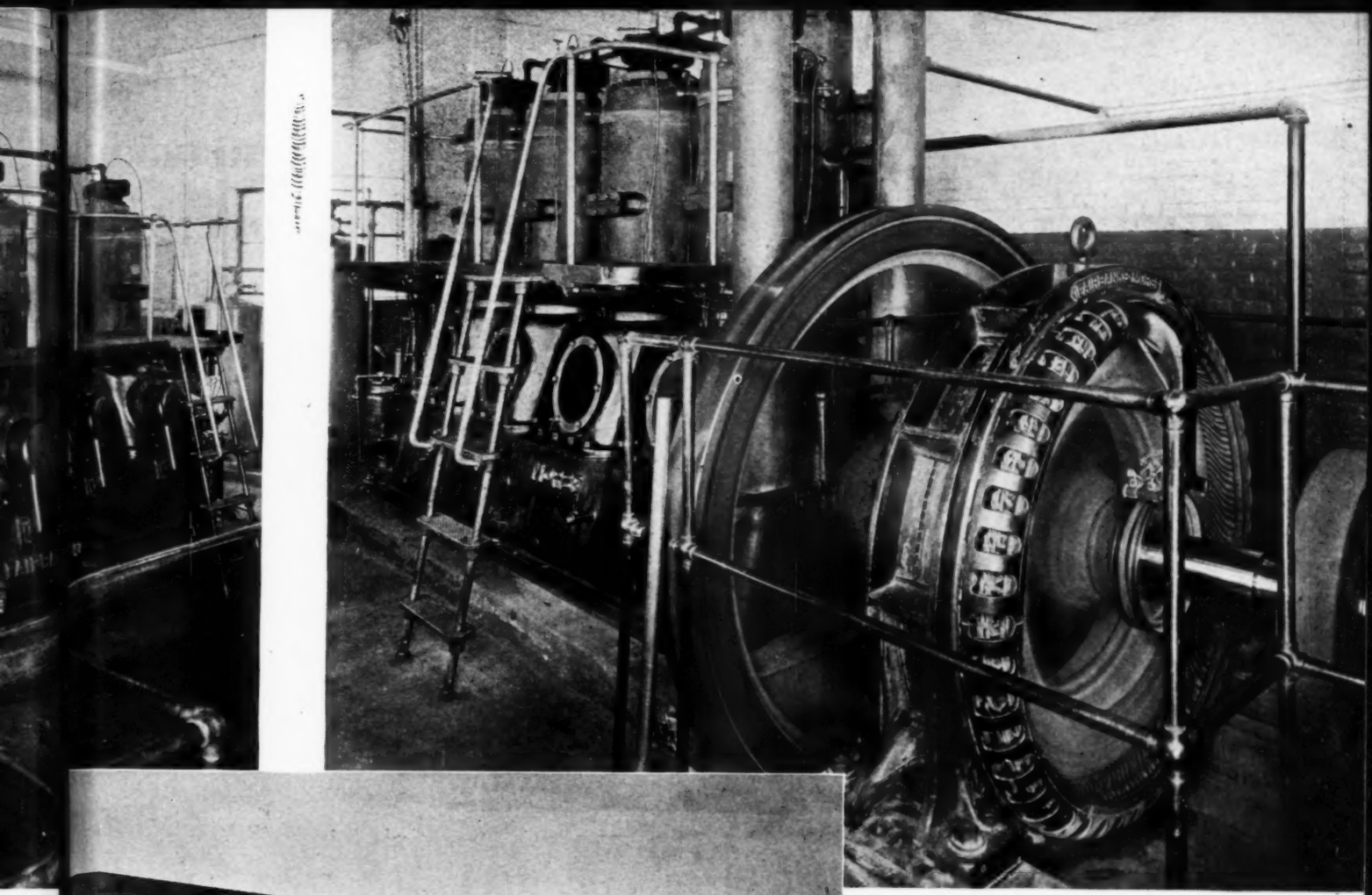
Once undertaken, the inquiry was extended to include a thorough overhauling of both engines with micrometric inspection of all cylinder walls, something they had not had since installation. It had been customary to tear down the engines every year for check-up and cleaning, and replacement of such parts as worn rings or bearings.

With what result? The engines—successors to the blind horse common in country elevators fifty and more years ago—were found to be sound in wind and limb. They needed only a few minor repairs to insure their continuing to do the work of 500 blind horses for years to come.

Checkup of the 200 hp. engine found all cylinders in good condition except Number 4, which was worn .060 in. The knock was eliminated by installing a complete new unit—cylinder, piston and rod, and head. In Numbers 1, 2 and 3, maximum wear did not exceed .030 in. at the top, and they were out of round only .004 in.

In the 300 hp. engine, the cylinder walls were fairly smooth; some had been slightly scored but in general the condition was good. Pistons 3, 4 and 6 were found to be distorted and sufficiently out of round to justify replacement. "It seems as if we really must have built engines in those days," read the engineer's report on the 300 hp. engine. "This unit has been in service about twenty years and there is very little wear on the cylinder walls."

Repair and maintenance costs on the two engines have been unusually low through the years. The history of thousands of Fairbanks, Morse & Co. installations all over the United States shows the average maintenance cost in recent years to be about 65 cents per horsepower each year. The corresponding figure for both engines in the Commander elevator, for the full eighteen calendar years operated, 1926-1943, is 40 cents. (As there is no record of the mainte-



The other power unit is this 4-cylinder, 200 hp. Fairbanks-Morse Diesel.

View of the Commander Elevator Co., 2½ million bushel elevator, having 119 bins and a workhouse.

nance cost in 1935, an average for the nine prior years has been used for 1935 in this computation.,

While the average maintenance cost per year went up two cents on the smaller engine in the second nine years of the period, it went down 13 cents on the larger engine. The averages for the first nine years, the second nine years and the full eighteen years for each engine and for both together read, in order:

200 hp. engine:	27 cents,	29 cents,	28 cents
300 hp. engine:	55 cents,	42 cents,	48 cents
Both engines:	44 cents,	36.7 cents,	40 cents

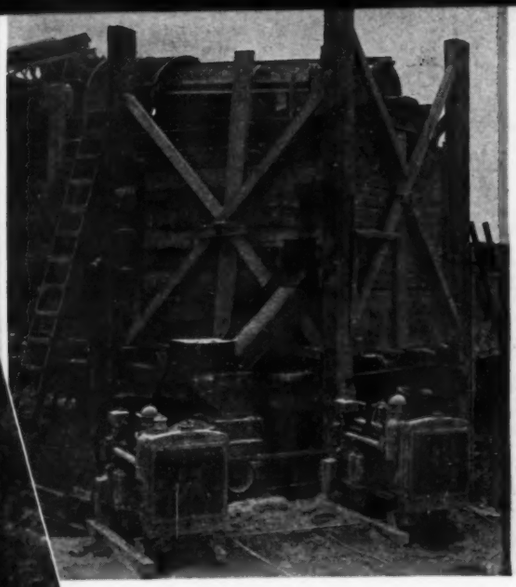
What about cost of operation? The operating cost of the plant has averaged $5,502 a year through the eighteen years. This amount covers fuel oil, lubricating oil, labor, maintenance and miscellaneous supplies.

What savings have been made over the full period as against the cost of purchased power? On the basis of current purchased power rates, it is estimated that elevators of similar construction handling about the same volume of grain with purchased power have an average cost of operation of $13,500 a year. On that basis, the Commander elevator has been saving $7,998 a year in operating costs. Multiply that by eighteen.

The elevator was able to pay off the investment cost of the power plant from savings in the early years. Continued savings have kept it in a position of advantage as compared with elevators in the terminal field operating with purchased power. Besides, it owns the engines. The knock in that cylinder was a boost—or led to a boost by causing a study that revealed the sound condition and emphasized the sturdy character of those Diesels.

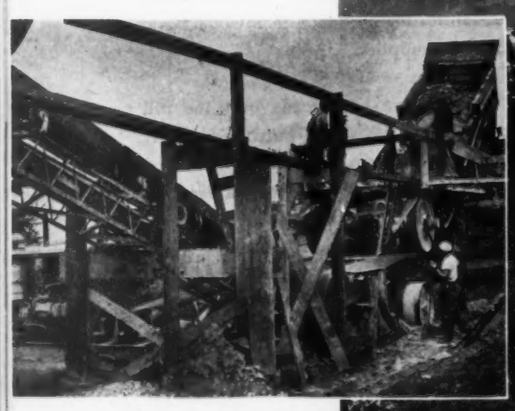
RUGGED OPEN-AIR JOBS FOR DIESELS

Arnold Terrell, superintendent, left, and Lloyd McCabe, owner of a limestone quarry near Pella, Iowa — completely powered by Caterpillar Diesels.



Rock crushing plant near Winterset, Iowa, driven by 2 Caterpillar Diesels operating 10 hrs. a day out in the open.

Below: Another open-air job — a combination jaw crusher and pulverizer driven by two Caterpillar Diesels. This plant is near Pella, Iowa.



This Diesel, lower left, operating efficiently in the dust of a crusher plant has to take all kinds of weather and keep going.

DIESELS IN TRANSPORTATION

Diesel truck-tank transporters are pressed into service hauling ammunition and supplies to the front by the Transportation Corps with U. S. Forces in France.

WITH U. S. ARMY FORCES IN FRANCE

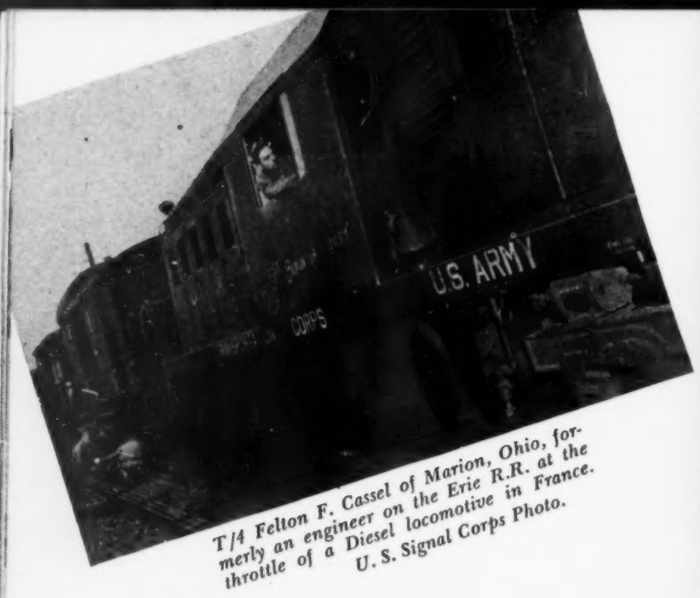
Editor's Note—From Headquarters European Theater of Operations comes this stirring account of faithful performance of Diesels on land and sea in the hands of the U. S. Army Transportation Corps during the liberation of France and the Allied drive into Germany. It names names and gives credit where credit is due and although longer than average DIESEL PROGRESS articles we are glad to reproduce this highly informative wartime Diesel saga in its entirety.

THE narrative of the Diesel engine, mechanical power-packed fighter, which is the pulmonary system of ships, trucks, locomotives, giant loading cranes and shop machines has yet to be fully told. The vital military role played by Diesel machines began before the United States entered the war. Diesel cranes swung lend-lease supplies and materiel aboard Liberty ships for shipment to Great Britain, long before the Japanese attack on Pearl Harbor.

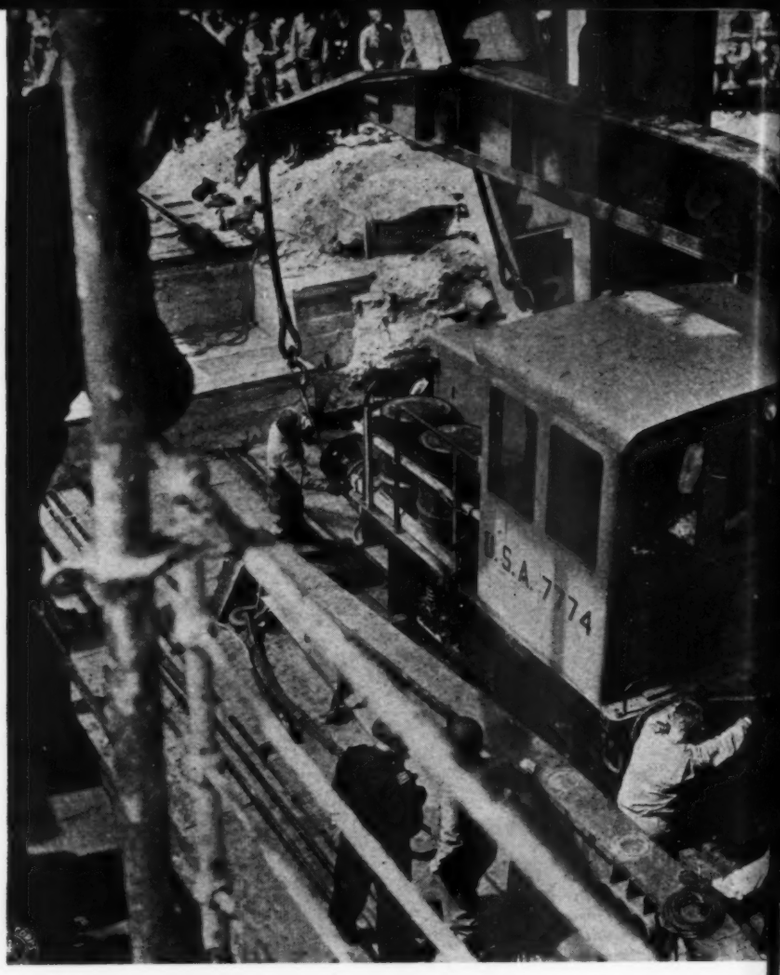
From July 31st, 1942, when the Transportation Corps in the European Theater of Operations, under Major General Frank S. Ross, became a separate Corps of the Services of Supply, Diesels have been the unsung heroes of all three divisions of the Corps. In Marine Operations, Motor Transport and Military Railways the engine has proven its worth.

Before they could operate on the Continent, Port Battalions had to be trained, through actual experience, to work cranes and other cargo handling equipment. Giant 35-ton electric barge cranes, powered by Caterpillar Diesels, capable of hauling heavy cargo, were utilized. The training schedule was stepped up through use of these cranes and also 30-ton stiffleg derrick cranes, equipped with a 5-drum Diesel hoister mounted on a 61 ft. derrick barge. Auxiliary machinery aboard the barge included a 10-kilowatt Diesel electric generator which furnished power for lights and a 5 hp. bilge pump.

Upon completion of their initial training, members of the port battalions were assigned to discharge cargo. Most of the companies favored a sturdy 30-ton capacity crane mounted on a 112-foot bolted barge. Furnished with operating plasma by its Diesel engines, the generating sets of which are mounted on a revolving platform, this 30-ton crane handles a load of 30 tons at a 65 ft. radius, and 45 tons at a 45 ft. radius. Tonnage output increased immensely after the installation of these machines which probed into the dark holds of ships to bring forth vehicles, small crawler cranes, landing barges, pontoons, refrigerated meats, sugar, flour, peanuts, jute, tea, lumber and a thousand other articles. Shortly after the establishment of the Allied beachheads in Normandy, these cranes were shipped across the Channel and immediately put to work in the huge task of getting supplies unloaded from landing craft. For months the smooth purring of the Diesel engines has been heard on the beaches and in the ports, as these cranes keep up an around-the-clock schedule.



T/4 Felton F. Cassel of Marion, Ohio, formerly an engineer on the Erie R.R. at the throttle of a Diesel locomotive in France. U. S. Signal Corps Photo.



GI train crews unloading a 150-ton Diesel switcher for Transportation Corps Railway Units in Europe.

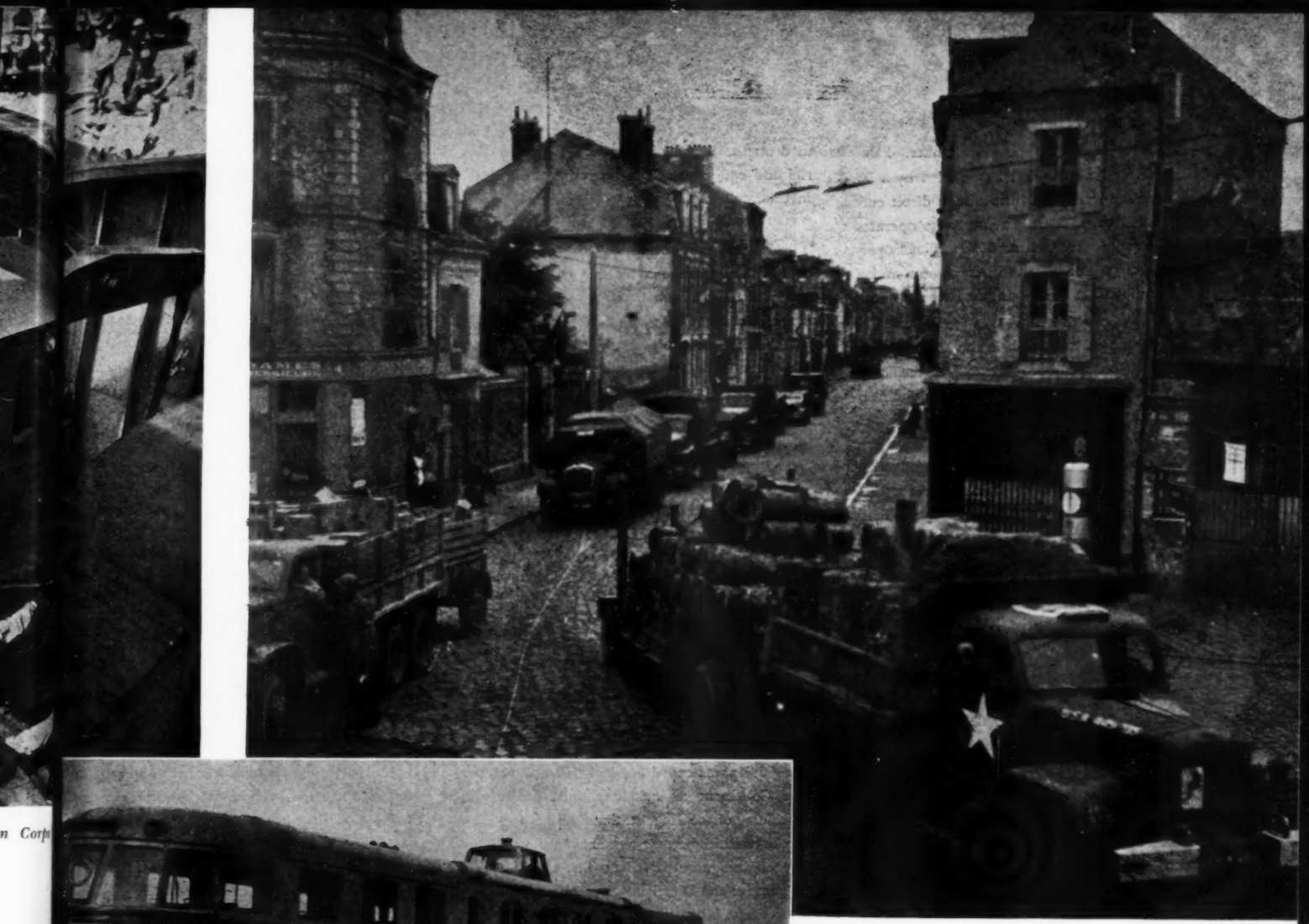
Two types of tugs were used by the Transportation Corps Harbor Craft fleet, the ST (Small Tug) and the LT (Large Tug). The ST is a 74-foot, all steel, single screw vessel, propelled by a 100 hp. Atlas Diesel and is capable of doing 9 knots. The fuel capacity is 34.47 tons, which is equal to 77,213 pounds or 10,650 gallons of Diesel oil. A slightly larger ST powered by 4 cycle, 8 cylinder, 560 hp. Superior Diesel is also in service towing supply barges. In operations off the coasts of Normandy and Brittany during the peak of Allied landings, these small tugs kept up a steady operational run from the English coastal ports to France. Under constant air attack and subjected to hours of grueling strain on its cylinders, the Diesels never faltered. The heavy barge cranes needed in salvage work on the beaches and in the Port of Cherbourg were brought across the Channel, by these sturdy craft and are engaged in reconstruction projects.

The Army's largest floating barge crane was towed across the Atlantic to England, thence to Cherbourg, early in July 1944, by an LT. The LT is an all-steel ocean-going work horse 123 ft. long, single screw, powered by a four cycle, 8 cylinder 1225 hp. Fairbanks-Morse Diesel doing 275 rpm. While running free of load the tug's rated speed is 12 knots and its cruising range is approximately 7000 nautical miles or 8050 shore miles. When loaded these tugs average approximately 4 knots and have a cruising range of 2660 nautical miles or 3040 shore miles. LTs have played an important part in the story of Transportation, acting as armed guards for convoys, towing back to port large vessels which have been torpedoed or mined, and bringing tows across the Atlantic. The trip across the ocean with the large crane in tow was made in convoy without incident. But as soon as the convoy hit the waters of the English Channel things began to happen. A thirteen-hour running battle with submarines in the pitch black of the night was filled with many hair-raising incidents. Escorting destroyers dropped depth charges and destroyed the undersea raiders. Earlier in the night, civilian skippers of the tugs were called upon to demonstrate their skill in maneuvering their vessels through mine fields without the aid of buoy lights. With the coming of day the convoy was safely headed into the Cherbourg harbor.

The crane, product of American ingenuity, is being used around the docks of Cherbourg as an unloading and wrecking unit. It is mounted on an all-welded steel barge 200 feet long with a beam of 78 feet. An outstanding feature of the unit is its 135-foot boom with a maximum handling capacity of 200,000 pounds at an 80 ft. radius, and 168,000 pounds at a radius of 104½ ft. It has a hoisting speed of 15 feet per minute and a hook reach of 60 ft., above water level at a 104½ ft. radius. The crane is of full circle revolving type, with a rope luffing boom mounted on the hull by means of a rigid elevated structured base. The crane hoisting luffing and slewing machinery is powered by electric motors which receive their power from two 400 hp. Atlas Diesel engines located below deck. Auxiliary machinery aboard the barge is comprised of a Diesel driven utility unit with an air compressor and lighting generator, a ballast pump and two 7½ hp. capstans.

The Army Transportation Corps is also using a large ocean-going tug of wood construction, 126 feet in length, twin screw with a cruising speed of 8 knots. Power for this type of vessel is furnished by two types of Diesels, one a 6 cylinder 12 in. by 15 in. unit of 600 hp., doing 400 rpm., and the other a 6 cylinder 14 x 17 in. 690 hp. unit at 300 revolutions per minute. Both engines are Fairbanks-Morse. Throughout all operations in which the large tugs have been involved, some lasting days on end, the intricate mechanism of the Diesel marine engine has never failed.

Shortly after D-day, when hospital ships were returning to English ports loaded to capacity, the Transportation Corps was called upon to aid in the removing of wounded from the mercy ships to waiting hospital trains ashore.



More truck-tank transporters hauling supplies in France.

Repaired by American GI's, this French Diesel passenger unit is taken on a trial run. Signal Corps photo.

The job called for a small harbor vessel easily maneuvered and equipped with litters and motors heavy enough to stand long hours of steady use. So, the Harbor Craft companies placed into service a small 65-ft. freight and passenger boat with a running free load speed of 10½ knots. The vessel has a cargo capacity of 20 tons and a fuel capacity of 900 gallons. Two types of engines are used in these hard-fighting nautical GIs. In some there are an 8 cylinder, 4 cycle Superior Diesel, producing 220 bhp. at 1500 revolutions per minute, with a 3:1 reduction gear, which turns a 44 in. x 36 in. propeller at 500 rpm. Other vessels are equipped with a 4 cylinder, 2 cycle Kahlenberg Diesel engine, producing 120 hp. at 375 rpm. This unit is a direct drive engine, which gives the boat a speed of 9½ knots.

Activity surrounding the daily schedule of the Army's fleet, and its Diesel-engined nerve center is not just one cargo haul after another or a routine patrol about the harbors. Many of the vessels have been through heavy shell-fire and bombings. Two MTLs (Marine Towing Launches) became separated from their escorting destroyers during a heavy fog in a Channel crossing, and the skipper soon found they were beneath the shadow of German guns on one of the Jersey Islands. One tug was set afire by a salvo from the shore batteries, and later sank. The other limped back to port with its rudder torn away, but the ever-faithful Diesel engine came through without a scratch to become an unsung hero.

Off the coast of Brittany, during the attack on Brest, a thrilling and hair-raising episode in the drama of supply took place. Loaded to its full 650-long ton capacity with high test octane gasoline, a 162-foot "Y" boat tanker was drafted by a mine-sweeping flotilla to aid in clearing the waters around Brest of the deadly explosives. A single contact with one of the dynamite-loaded steel bubbles would have spelled disaster for the entire flotilla. By use of his Diesel engine, the skipper worked his little tanker in and out of the mine field and accounted for a goodly number of the mines. The power unit, a 400 bhp. Enterprise Diesel came through the ordeal in excellent condition

and is still propelling the same tanker. Electrical power for the vessel is provided by a 50 hp. Diesel generator set furnishing a direct current of 115 volts. This generator also operates an air compressor. Another 50 hp. Diesel operates the cargo pump in the pump room and a bilge and ballast pump in the engine room.

The part played by Diesels in the Motor Transport Division has been limited to traffic in tanks, ammunition and the hauling of railway equipment. The only Diesel equipment used by the Transportation Corps on the highways is a 45-ton Tank Transporter. Ordinarily used to carry tanks to the Front and to bring salvaged tanks to the rear for repair, the Tank Transporter was drafted into service in the United Kingdom to haul rail equipment to awaiting ships. Light rails were spot-welded to the trailer bed and equipment then driven onto the rails. In many cases the transporters were loaded on LCTs (Landing Craft Tanks) and landed on the French coast, with their rail equipment load intact. Large 30-ton Diesel locomotives were moved across the Channel in this manner. The transporters are now used to carry ammunition to Allied armies driving into Germany. This most powerful of trucks used by the Transportation Corps is powered by a 6 cylinder, 4 cycle Hercules Diesel engine with 893 cubic inches displacement and a governing speed of 1600 revolutions per minute.

The truck of the transporter is approximately 25 feet long and 9 feet wide with a storage tank that has a capacity of 150 gallons of Diesel oil. Ten wheels are required for the truck and 24 for the trailer, which is 30 feet long and 10 feet wide. The entire unit averages about 2 miles per gallon of fuel oil.

Diesel engines are more widely used by railway units than by any other branch or division of the Transportation Corps. In pre-invasion activities in the United Kingdom, much rolling stock had to be assembled, such as prefabricated box cars sent over from the United States. Locomotives also had to be conditioned and readied for service both in the United Kingdom and on the Continent. The American plan of mass production was put into operation by the soldier railroaders. With the aid of Ingersoll-Rand air compressors, powered by 6 cylinder Diesels, having a capacity of 315 cubic feet a minute, construction lines were kept busy on a twenty-four hour basis as air-hammers, rivet guns, pneumatic drills, paint sprayers and other air-driven tools drew their power from the giant Diesel machines. Diesel switch engines and General Electric Diesel locomotives were used on the British railways to haul war materiel and equipment from depots to cargo ships in Channel ports.

The first rail equipment landed on the beaches of Normandy consisted of two complete work trains of eight 20-ton flat cars and two 25-ton, single engine, 150 hp. G.E. Diesel-electric switchers. This equipment was brought across the Channel by LCTs and was mounted on Diesel motored tank transporters which hauled it directly to the railyards.

The French railways have contributed considerable equipment to alleviate the transportation problem. Shortly after the fall of Cherbourg a scouting party from the Transportation Corps uncovered a giant streamlined Diesel locomotive and passenger coach combined, near Isigny.

The unit is twice the size of any passenger locomotive in service in the United States, having a seating capacity of 50 persons. This mammoth Diesel rail car is operating on the Cherbourg division.

Original plans called for Diesels to be used on the Continent as switchers only, but as the problem of coaling stations and sheds and water facilities became more acute, the oil burning engines were placed on line of road. One advantage the Diesel has over steam is its superior adaptability to camouflage. In operations up to the front the absence of glare from the fire-box, sparks from the stack, and the quietness of the Diesel engine enables the locomotive to slip up quietly without enemy observation. Diesels can also be hooked up in tandem and operated by one man, but steam locomotives cannot.

The Military Railway Service has in operation on the Continent three types of heavy Diesel locomotives—380 hp., 500 hp. and 650 hp. The 380 unit is a 45-ton General Electric locomotive having four 8 cylinder Caterpillar Diesels with a 5¾ inch bore and 8 inch stroke turning 1100 revolutions per minute for a maximum speed of 35 miles per hour. It has a starting speed of 5 miles per hour. The fuel capacity is 250 gallons and cooling water capacity 40 gallons per engine. The trucks are of the pedestal type and the wheels are 38 inches. Length of the locomotive is 33 feet 4 inches with a maximum width of 9 feet.

The 500 hp. model is also a General Electric product of 75 tons, with four 6 cylinder Diesels having a 7 inch bore and 10 inch stroke turning 1000 revolutions per minute for a speed of 40 miles per hour. The fuel capacity is 400 gallons and cooling water capacity 36 gallons per engine. The trucks are also of the pedestal type and wheels are 42 inches. Complete length of the locomotive is 42 feet 3½ inches with a width of 9 feet.

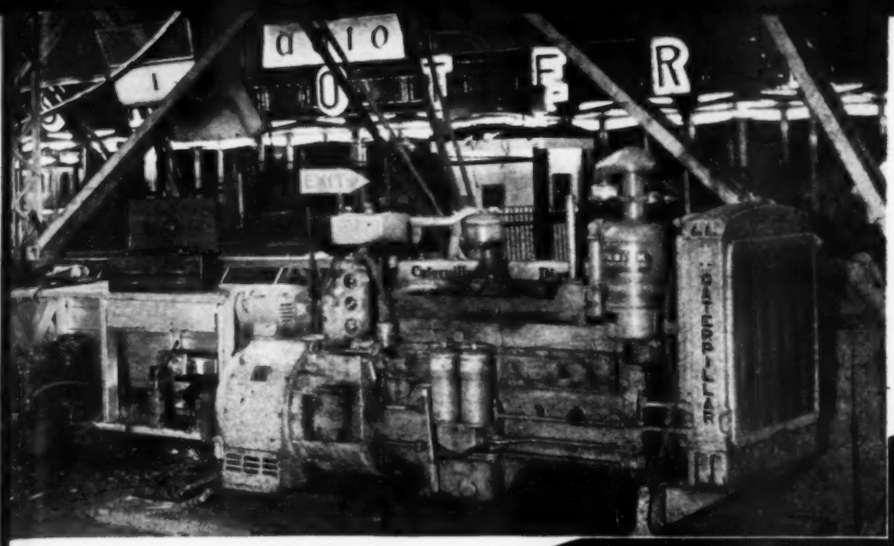
The high-powered 650 hp. model locomotive is a Whitcomb Diesel weighing 65 tons. It has four 6 cylinder Diesels with a 6¾ inch bore and 8⅜ inch stroke turning 1200 rpm. for a speed of 46 miles per hour. The fuel capacity is 750 gallons and cooling water capacity 35 gallons per minute. The type of truck on this locomotive is the pedestal design and wheels are 38 inch rolled steel. The length of the engine is 43 feet 3½ inches and the width 9 feet 10 inches.

Railway operating battalions on the Continent are now operating from rolling shops made from captured rolling stock and equipped with American machinery. An International Harvester 30 kilowatt, 220 volt, 60 cycle AC Diesel generator furnishes power for the shop machinery. The generator starts with gas, but with the aid of a switch gear is thrown over to full Diesel operation. Power for lighting the shop train is furnished by a Ford 5 kilowatt, 110 volt AC Diesel unit. Two 350 cubic ft. capacity air compressors furnish power for all pneumatic tools. One compressor is a Worthington and the other is Ingersoll-Rand make.

When General Patton was making his historic drive toward the German border the need of gasoline for his tanks necessitated the immediate movement of 38 cars of the precious fuel by rail. The railway operating battalion responsible for the movement called upon one of their heavy Diesel locomotives for the haul and the tanks received gasoline in plenty of time.

Another Diesel locomotive came through during the same drive as it pulled an ammunition loaded train over torn rails and pitted roadbeds, the GI engineer at the controls had had but ten minutes instruction in its operation.

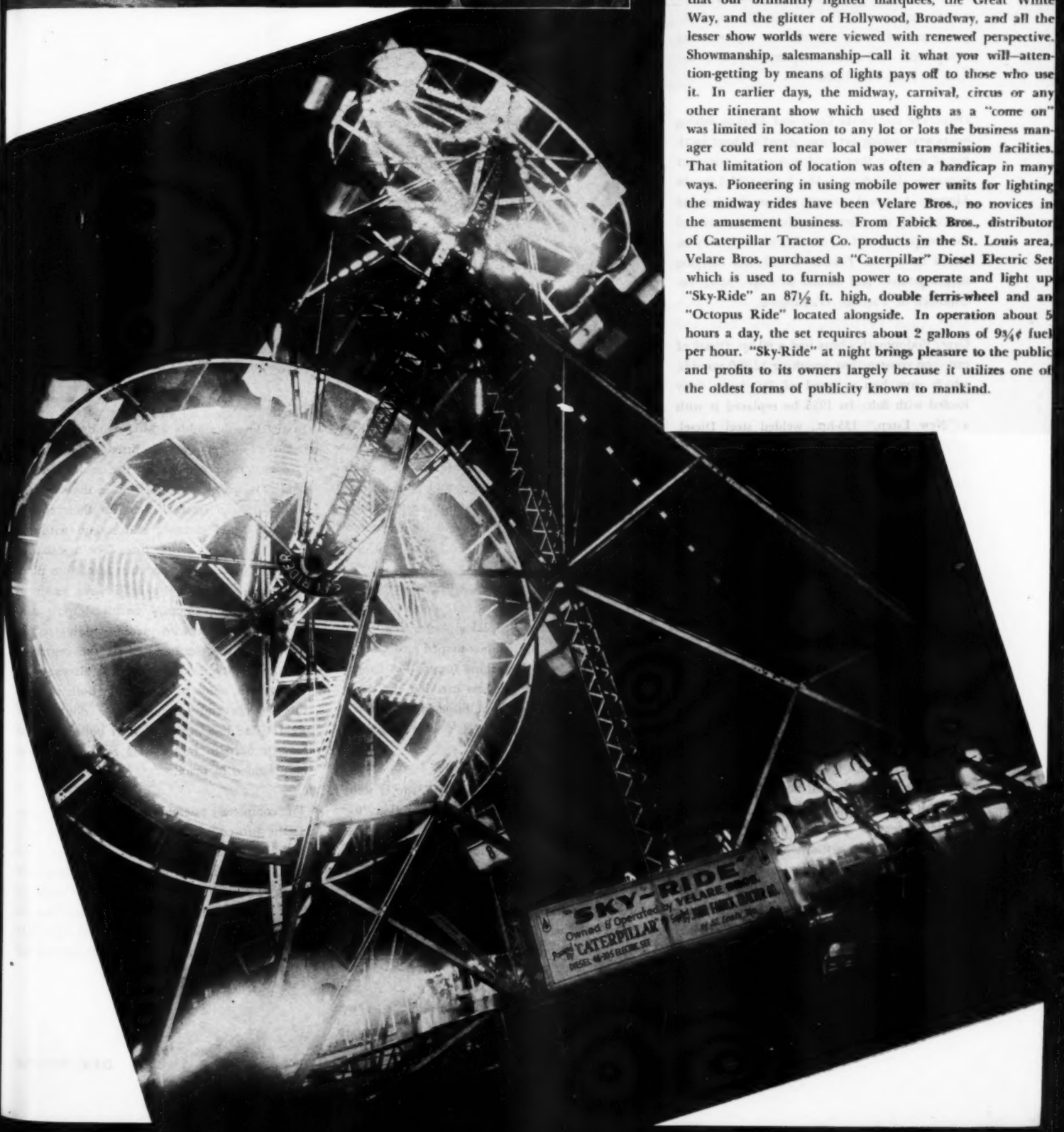
A bridge collapsed just as the last car passed over, but the Diesel had again come through to deliver vital supplies. Diesel locomotives have played an important part in the rebuilding of the French railway system. The first train into Paris was pulled by a heavy Diesel engine and the first supply and hospital trains into Belgium were also Diesel driven. In the final account of the dramatic role played by equipment in the present conflict, the Diesel engine will receive top billing.



LIGHTS—

WHERE YOU WANT THEM

SINCE man first wondered at the meaning of sun, moon, and stars, and later worshipped under the star in the East, the attention-getting value of light has been clearly evident. It was not until the blackouts, however, that our brilliantly lighted marquees, the Great White Way, and the glitter of Hollywood, Broadway, and all the lesser show worlds were viewed with renewed perspective. Showmanship, salesmanship—call it what you will—attention-getting by means of lights pays off to those who use it. In earlier days, the midway, carnival, circus or any other itinerant show which used lights as a "come on" was limited in location to any lot or lots the business manager could rent near local power transmission facilities. That limitation of location was often a handicap in many ways. Pioneering in using mobile power units for lighting the midway rides have been Velare Bros., no novices in the amusement business. From Fabick Bros., distributor of Caterpillar Tractor Co. products in the St. Louis area, Velare Bros. purchased a "Caterpillar" Diesel Electric Set which is used to furnish power to operate and light up "Sky-Ride" an 87½ ft. high, double ferris-wheel and an "Octopus Ride" located alongside. In operation about 5 hours a day, the set requires about 2 gallons of 9¾¢ fuel per hour. "Sky-Ride" at night brings pleasure to the public and profits to its owners largely because it utilizes one of the oldest forms of publicity known to mankind.



ESTEP DIESELS

PIONEERED ELECTRIC WELDED STEEL CONSTRUCTION

PRACTICAL considerations of the Pacific fishing fleet years before the war are responsible for construction methods in many of today's Diesel engines powering vessels of war. Experiences of A. C. Estep, designer and builder of Diesel engines since pioneer days in the industry, well illustrate this fact as he relates how he turned from cast iron engines to electric welded steel construction in the early 30's to give fishing boat owners more pay loads per season. The record of the engine builder's results with electric welded steel construction was turned over to The Lincoln Electric Company, manufacturer of electric arc welding equipment, and that company supplied the data on Estep's methods.

Owners of the Pacific Coast and Alaskan fishing boats were asking for more speed without sacrifice of space so they could make more trips per season to the fishing fields, Estep told Lincoln Electric. A typical example of how this demand was met by the engine builder, who organized the Estep Engine Co., Seattle, in 1931, may be found in the *La Touche*, a 70-footer carrying 60,000 pounds and owned by Capt. Matt Vodonovich of Tacoma, Washington.

Capt. Vodonovich's boat had a 60-hp. Diesel of cast iron construction, weighing 12,000 pounds, which gave him a speed of 7½ knots fully loaded with fish. In 1935 he replaced it with a "New Estep," 135-hp., welded steel Diesel, weighing 11,750 pounds, which was installed in the same space as the heavier and lower horsepower engine. This change gave the *La Touche* a fully-loaded speed of 10 knots. The 35 per cent gain in speed gave the owner enough more pay loads to pay for the new engine in two years, greater profits for the seven years following, and the outlook today is that those better profits will continue for years to come.

Estep figured that there was a two-way profit by adopting new designs and welded construction for Diesel engines. Fleet owners gained in payloads and his company gained because of lower Diesel production costs.

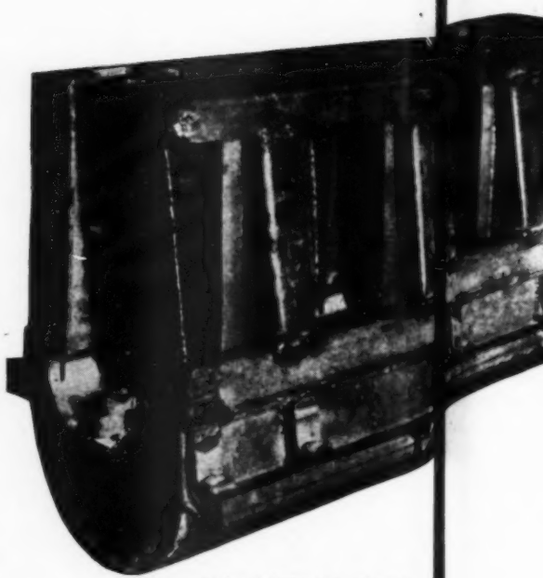
"The first cost for a fabricated steel set of welding jigs on this job would be less than the pattern cost for cast iron construction," the engine builder reported. "We did all our own steel fabrication and the actual labor time for fabricating and electric welding was less than the labor time for core making, moulding and casting on our corresponding cast iron parts for older models of Estep-designed Diesel engines which had been built from 1918 to 1931. By use of welded construction we also found many small parts could be made to advantage, such as brackets, levers and rocker arms."

A savings of 40 per cent in weight and 15 per cent in space was offered the fishing trade on the heavy-duty engines which they require, according to Estep, by going to welded construction. Additional features were an engine of streamlined, modern appearance and elimination of the possibility of fractured parts or deefctive castings in service. Any accidental damage to steel parts could be readily repaired out on the job, even in remote places of Alaska.

The welded steel frame and base for a 135-hp. "New Estep" Diesel, shown in Fig. 2, effected a production cost saving of better than 15 per cent over cast iron. The welding technique followed in construction was to use cast steel saddles, first rough machined, for crank shaft main bearing supports. The ⅜-in. steel boiler plate U-shaped main cross webs were flame-cut from stock and the seven required for each engine were stacked together and machined to a half-circle in the center to fit over a previously machined groove on the outside of the main bearing saddles.

Location spots were machined hook shaped on the U webs at the two outside points opposite the main bearings to later locate the main fore and aft ⅜-in. steel box-shaped girder members which form the engine foundation flange. Cast steel support brackets carrying the main hold down bolt holes were fitted in the foundation flanges. The tops of U's were also semi-machined.

On completion of the above work, the U webs were put in a welding jig, one at a time, for electric welding into sub-assembly units. The jig had a steel mandrel to locate alignment of the main bearing saddles as well as positioners for the several side stiffening and support angle irons, top brackets, etc., to be welded on the U webs. Each sub-assembly was given a heat treatment to normalize it before final assembly.

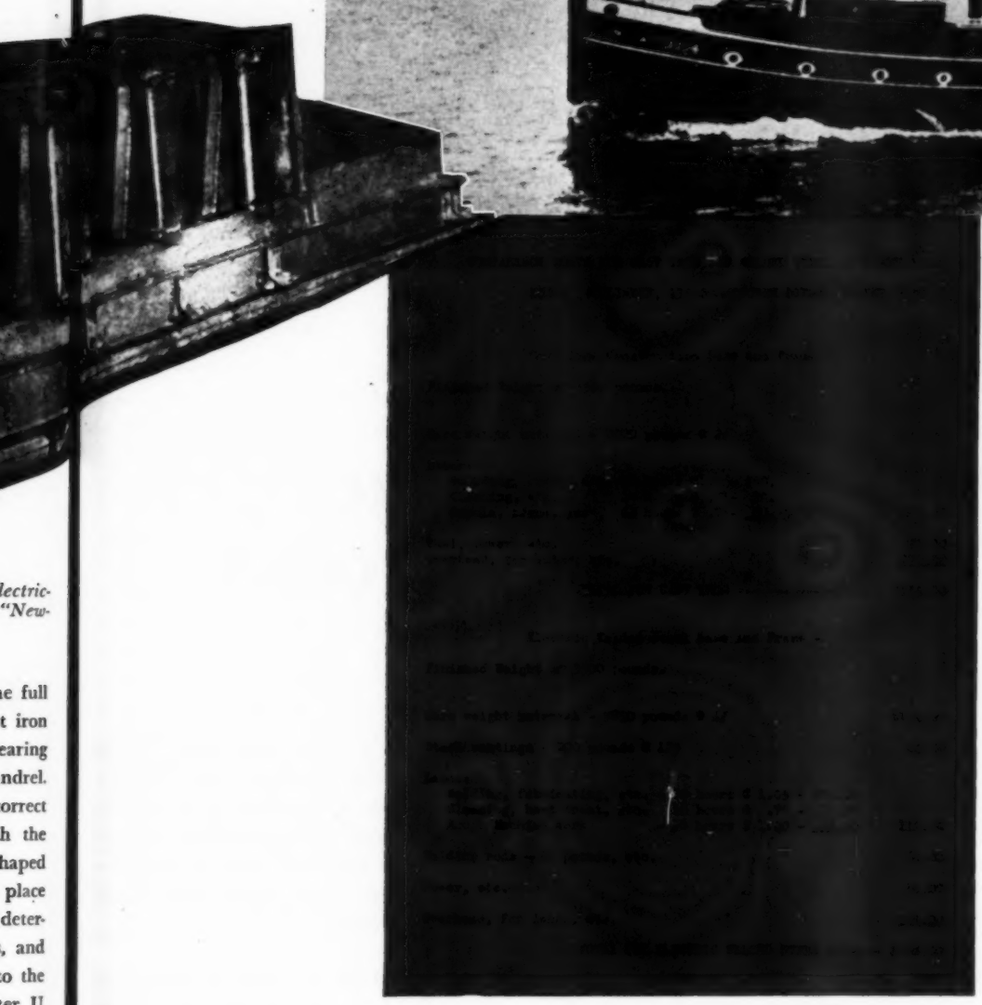


View of the fabricated, electric-welded steel frame of the "New-Estep" Diesel.

In the final assembly a long mandrel, the full length of the engine, was fitted with cast iron bushings machined to fit the main bearing saddles which were clamped on to the mandrel. This held the cross U webs on their correct center-to-center distance and square with the frame crank shaft center line. The box-shaped foundation members were then fitted into place on the outside of the main U webs, as determined by the previously machined spots, and electrically welded into place. Welding to the foundation members started at the center U webs and worked out to the ends, alternaingly. These fillet welds were done on both sides of the U webs and repeated for a double pass weld. The half round shaped bottom of the base, a 5/16-in. boiler steel rolled plate was here welded in place.

The completely assembly during the above part of the process was secured upside down to a floor plate or platen. The cross webs were tack welded only to the inside of the base half shell. Then, the frame was released from the floor plate, but the main mandrel arbor was left in place, while the frame was turned right side up for fillet welding of the cross U webs to the

The seiner, "La Touche" which achieved 35% gain in speed when its 60 hp. Diesel was replaced by an Estep welded engine weighing less but of more than double hp.



inside of the bottom shell plate. The whole engine frame was rolled from side to side for the best position in doing this work. After annealing, the frames were line-bored and re-machined on top.

The 250 lineal feet of shielded arc welding in the job required 60 pounds of 3/16 and 1/4-in. heavily coated electrode welding rod. Where possible, the welding was done with a single pass. Most joints were fillet welds or corner welds and the side plates were butt welds in 60 degree V-grooves.

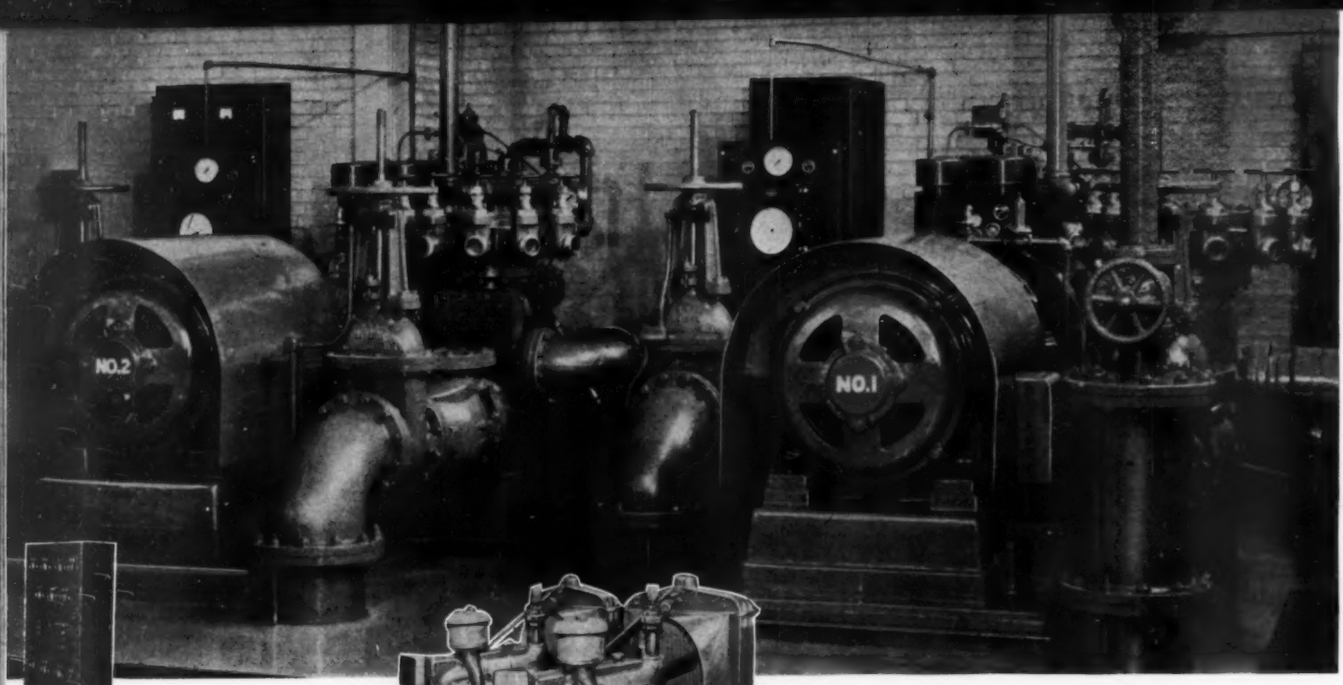
On completion of the final welding the majority of the frames for Diesel engines were stress relieved by placing in an annealing oven and slowly heated for 4 hours to 900 degrees and then allowed to cool slowly to room temperature. This low temperature was used because steel castings for bearings and main cross U web assemblies had been previously stress relieved at temperatures of approximately 1200 degrees. Comparing an Estep-designed Diesel engine of cast design and the later one of welded design and both being 4 cylinder, 135 hp marine engines, Estep gave these figures: size—12 ft. 10 in. long by 6 ft. high by 40 in. wide for the cast iron against 10 ft., 10 in. long by 5 ft., 10 in. high by 36 in. wide for the welded fabricated steel. Weight of the complete cast iron engine was 20,000 pounds and of the welded steel engine, 11,750 pounds.

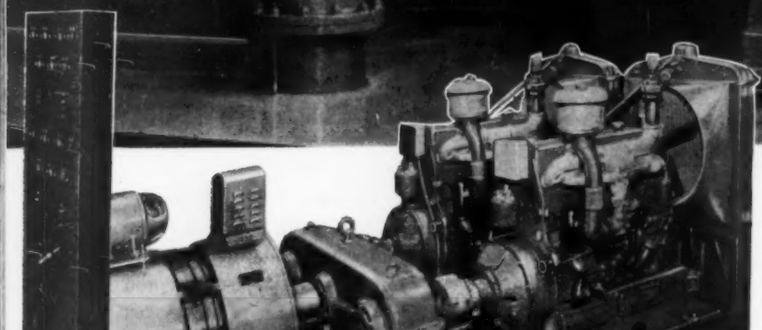
A detailed break-down in costs for the same type engine base and frame in cast iron and fabricated steel is supplied by Estep, who pointed out that the figures are for 1934 and 1935 costs in small lots. Larger scale production would have shown an even more favorable comparison for welded construction, he said.

Diesel engine experience of the builder of these steel frame electric welded Diesel engines, dates from the time he assisted in 1911 on the installation of the first full Diesel marine engine to be put to commercial work in the United States, a European-designed machine. Later, Mr. Estep was with the Atlas Imperial Engine Co., for several years and here helped to sell and install in 1914 the company's first "Atlas Imperial" full Diesel engine.

Some of his most valuable experience was when for several years he operated a general marine machine shop, "Estep & Kimball" in Seattle, Wash., where they installed new Diesel engines of various makes plus doing general repair work on Diesels. Here in 1918 he designed and built his first Diesel, later in 1921 he joined the Washington Iron Works who took up the manufacture and sale of the engine known to 1931 as the "Washington-Estep" Diesel.

Early in 1944 Mr. Estep accepted the position as Chief Engineer for the Atlas Imperial Diesel Engine Co., which puts him back with Atlas after 30 years.





Above: A pair of Waukesha engines and Dayton-Dowd fire pumps with dual automatic control in the A. F. Barron, Chicago, plant. Left: Dual engines driving an E-M generator through Morse chain drive with Synchro-Start automatic control panel.

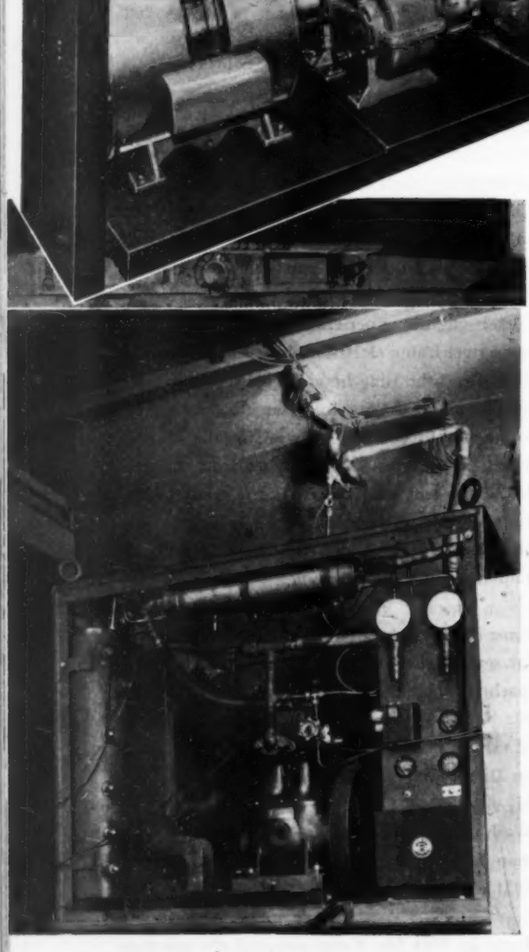
AUTOMATIC ENGINE CONTROLS

By C. A. GENSKE*

WITH the advent of automatic controls, Diesel engine operation has become as flexible as the electric motor and in many cases, more reliable as it is not dependent on any outside power source which may fail at the most critical time. Starting and stopping is done automatically and instantly upon demand, and with a well laid out system the engine is fully protected at all times, while starting or running, against any abnormal conditions. Therefore, the need of an attendant, except for a periodic servicing, is entirely eliminated. Since the controls have only one duty to perform and are never absent or asleep, more dependable operation and longer life can be secured from the engine.

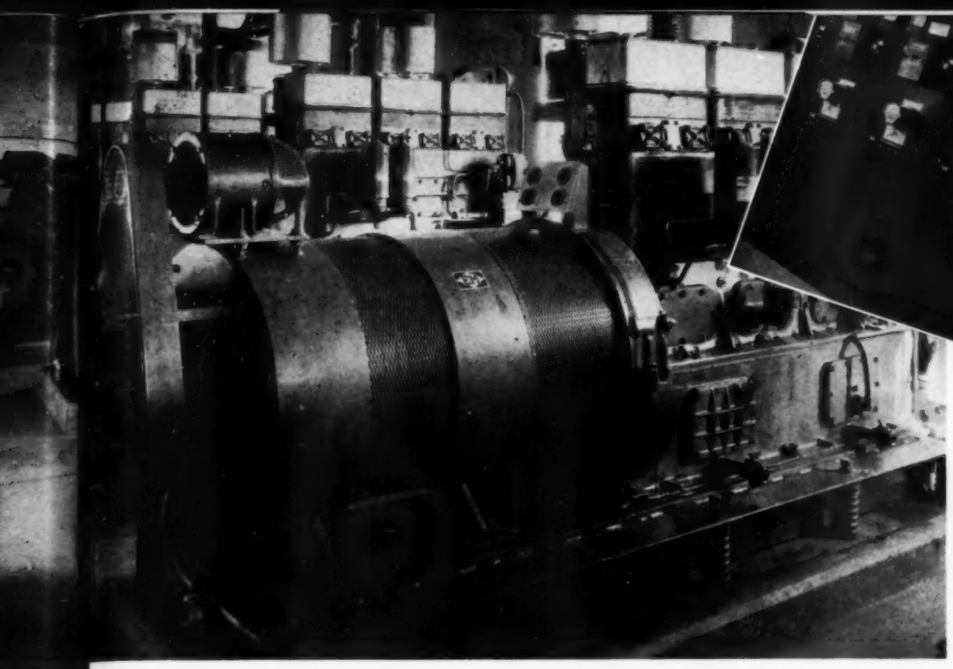
Automatic controls have broadened Diesel engine application to an extent undreamed of a few years back. Engines so equipped are now being used for emergency stand-by sets, refrigeration, air-conditioning, fire protection, underpass pumping, water and sewage pumping, rural electrification, oil field work, marine installations, and many others too numerous to mention. Hundreds of thousands of automatically controlled Diesels are being used by our armed forces all over the world under the most severe conditions and where a failure might cost the lives of many men.

For fire protection, the automatic engine drive has proved particularly advantageous. In some of the installations the engine driven pump is used as a stand-by for an electric drive but in many cases the engine is the only source of power. Often, in case of fire, the power lines burn through, or are cut to prevent further damage, thereby disabling all electric driven equipment. The engine, however, is independent of all outside power sources and will continue to operate until the fire is out. Special controls built to the standards of Fire Underwriter's and Insurance Companies are available that will automatically start the fire pump upon drop in pressure, operation of a deluge valve, fire alarm box, etc., and also provide automatic test starts with a continuous weekly record of

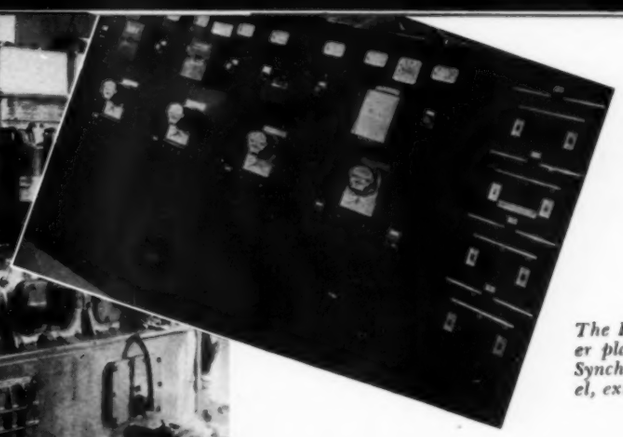


View showing application of full automatic controls to a mobile refrigeration unit.

* *Vice President, Synchro-Start Products, Inc.*



Three Buda Diesels and Electric Machinery generators all under full automatic control by Synchro-Start in the East Montpelier, Vt., power plant.



The East Montpelier power plant switchboard with Synchro-Start control panel, extreme right.

all starts and pressure variations.

Engine driven compressors for refrigeration and air-conditioning are also becoming very popular. Thousands of engine driven units have been provided as meat coolers to the Army and Navy for both mobile and stationary installations. After the war, refrigerated trucks that are able to haul fresh produce from the farms over long distances to the metropolitan areas without spoilage, as well as air-conditioned buses and cars, will be in great demand. The automatic engine that will start and stop according to the demand of a thermostat is the ideal source of power for these applications as it will assure dependable temperature control under all conditions, whether the vehicle is in motion or standing still. Also automatic engine driven cooling units for permanent installations will be in demand for power failure stand-by and for locations isolated from power sources.

Underpass pumping is another vital application for automatic engines that start and stop according to float level demand to prevent dangerous flooding conditions. In the event of bad storms where the underpass pumps are urgently required, the electric power at these remote locations is most apt to fail, thereby putting electric driven pumps out of commission, while the engines will be unaffected and continue to function. With proper self testing control systems on these engines, they only require a periodic check by the district service man.

For Marine or Maritime use, an automatically started standby generator set has been proven to be indispensable for the operation of radio, steering, ship communication, emergency lights, etc., in case of failure of the main ship's supply. In case of damage or breakdown of the boilers or turbines, these emergency sets immediately go into action to provide power that may mean saving the entire ship and its crew. These emergency sets are just as vital in peacetime as in war.

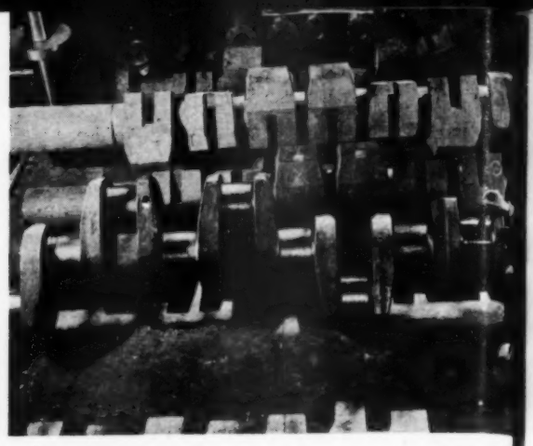
When automatic engine controls were first introduced, they were not taken very seriously. Although it was admitted by practically all of the leading engineers in the industry that the idea was good, they were very doubtful as to their reliability and had to be shown. Without doubt, some of the early controls were not fully reliable and would sometimes fail when most needed, as were many other things when in their infancy. But over the past ten or fifteen years automatic controls have been refined and perfected, until today controls may be obtained that can be relied upon to perform their duty at all times even under the most adverse conditions.

Modern dependable engine control systems are designed not only to start and stop the engine upon demand, but also to protect it against all possible damage while starting and running. They incorporate limited over-all cranking periods, with cycles of cranking and rest to give the best possible chance for the engine to start and also protect the starting system and battery from damage due to excessive cranking. While the engine is running they stand guard over it, and shut it down before any damage can be done due to low oil pressure, overheating of the cooling water, excessive speed, etc. Should the engine fail to start in the time allowed, or be shut-down due to any abnormal condition, a definite signal will be given to summon an operator and indicate the exact cause of the trouble so that the attendant can immediately correct it. With multiple engine plants, a standby engine will be immediately started to replace the one that has failed so that no loss of service will be encountered.

Almost any type of control from the simplest starting or safety stop to multiple engine load control panel boards are available for every type of engine. Where only automatic starting and stopping is required without safety shutdown provision, various types of controls are available that will crank the engine, cut-out the starting motor after it has started and shutdown the engine upon the operation of any desired type of pilot switch. On the other hand, safety stop controls are available to protect the engine after it has been started manually and can be obtained either with or without indicating signals that show the exact cause of shutdown. Or the automatic starting and safety protective controls can be had in combination units for complete control of the engine. For multiple engine plants, complete systems are available for automatically starting and stopping additional engines according to load demand and providing complete protection.

More and more automatically controlled engines will be required with each passing year. The present war has done much to stimulate the demand for automatic engines and when material is again available for peace time uses, these automatic engines will be in greater demand than ever before. The big improvements in engine design and the mass production methods developed during the war will provide much better engines at a lower price, thereby making cheap dependable power available for all types of service. Engine controls too, have made great advances during the war and better ones will be available at lower prices for peacetime service. Controls are already developed that go far beyond those of the past in taking over all of the functions of starting, stopping, governing, and guarding those superior power units of the future.

CAST CRANKSHAFTS SUCCESSFUL ON LARGE MARINE DIESELS



The cast crankshaft foreground, requires less ma chining, thus effecting economies in material an time.

THE experience of the U. S. Army in successfully using proferall cast crankshafts in large Enterprise Diesels of the direct-reversible marine type may result in materially lowered costs of engine production in the postwar era.

When the war emergency started in this country, the government called upon Diesel manufacturers to increase engine production to a level exceeded by several times previous records. However, in meeting the goal set by the government, Diesel manufacturers faced an acute shortage of forged steel crankshafts. With the war demands for all types of equipment severely taxing the heavy forging facilities of the nation, it was apparent that delivery of engines needed for all types of vessels under construction in all the shipyards would be reduced.

The gravity of the situation may be best judged by the fact that in the U. S. Navy today, horsepower developed by Diesels far exceeds the combined power outputs of all steam equipment. Besides supplying the demands of the Navy, Diesel manufacturers were also expected to meet the requirements of the U. S. Army and Maritime Commission.

Although it was already an accepted fact that high grade cast crankshafts would deliver satisfactory service in some stationary Diesel engines powering electric generators, and in certain types of engines for the Navy, this type of shafting had never been developed for heavy marine engines.

Colonel W. W. Moore, USA, for many years in charge of the designing and building of various types of vessels for the Quartermaster General and later for the Office of the Chief of Transportation, U. S. Army, made a personal investigation and study of the matter. His findings led to the conclusion that cast crankshafts would perform successfully in large, direct-reversing marine Diesels. Completely satisfied with his findings, Col. Moore decided on the adoption of 11 inch cast crankshafts for this type of engine, despite skepticism from his staff and many other Diesel experts.

Acting on this belief, and in view of the time element involved, Col. Moore decided against the usual policy of ordering a single experimental engine and placed orders for a large number of eight-cylinder Diesel engines with cast crankshafts. These engines were all Enterprise direct-reversible Marine Diesels with 16 in. bore and 20 in. stroke. Equipped with Buchi-type turbochargers, they were designed to develop 1200 to 1400 bhp. at 275 rpm. for installation in large Army tugs. This decision by Col. Moore eliminated the production bottleneck with the result that the Enterprise Engine & Foundry Company was able to deliver the required engines to shipyards in ample time to meet production schedules.

The cast crankshafts, carefully analyzed in regards to torsional vibrations, were produced by Campbell, Wyant & Cannon, one of the firms that has had extensive experience in the manufacture of medium cast shafts for stationary engines.

Subsequent performance of these vessels has amply substantiated the soundness of Col. Moore's views in pioneering the use of cast crankshafts for larger marine engines. In the past year the vessels have given excellent service during thousands of hours of operation in the various war theatres.

The cast shafts have certain specific advantages over the conventional forged crankshaft as follows:

1. Less time is required for production.
2. Less waste of material which must be removed in machining operations as illustrated by the photographs.
3. Reduction in time required for machining as compared with forged shafts.

Cast crankshafts operate exceptionally efficiently where the original engine design provides for liberal shaft dimensions above normal requirements to care for torsional vibrations.

Material hardness is from 250-320 Brinell. Material responds excellently to polishing, thereby providing exceptionally good bearing surfaces. The physical properties of cast Proferall material in these large crankshafts have been determined to be as follows:

Tensile strength—52,000 psi. for standard material and 56,000 to 58,000 psi. for special materials.

Torsional modulus—based on the proportion of stress-strain used in actual practice, i.e., 4,000 to 8,000 psi., the resulting slope of line gives a torsion modulus of 8,000,000, as compared to 11,800,000 for steel. Torsional calculations based on this latter value yield results which agree with actual results.

The A.B.S., in computing cast shafts, uses the same formula as for steel. However, they use value of f = 4300 for standard proferall material and f = 4600 for the 56,000 psi. material. This results in a 7% increase in shaft diameter over that required for forgings.

While at the present time it is difficult to predict the influence that Col. Moore's pioneering will have on the future of the Diesel industry, it is a certainty that the industry will continue research on the matter of cast crankshafts which may result in reduced production costs of Diesel engines in the postwar period.

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SUPERVISING & OPERATING ENGINEERS' SECTION

"MORE ON CRANKCASE EXPLOSIONS"

Part 1

Conducted by R. L. GREGORY*

IN the December issue of DIESEL PROGRESS, there appeared a discussion by Mr. F. E. Faast, on the subject, "Diesel Crankcase Explosions—How to Prevent Them." This was an interesting and educational presentation of the subject, which should have been read by all engineers in Diesel work. However the writer of this section wonders if some of the statements made in this article, even though true, may not have been misconstrued by some of our readers, especially those not familiar with the various types of Diesel units. With this thought in mind, the writer would like to add a few remarks and suggestions on the same subject.

At the present time there are a lot of operators and engineers, who have been brought up to fill vacancies in Diesel plants, who are only familiar with the units in their plants. This situation is the result of a manpower shortage of experienced Diesel men. The fellows who are "filling in" so to speak for the duration, are for the most part, anxious to learn and do get a lot out of just such articles as the aforementioned one. But being unfamiliar with various types of units, when reading such articles they are apt to form snap judgments, which might be erroneous. I am basing this statement on the many letters that the writer has received in the past, which have clearly indicated this condition.

Mr. Faast opens his discussion with this statement, quote: "Wristpins have long been suspected as a source of most large Diesel engine crankcase explosions." This statement is true in the trunktype unit, and to some extent true in the crosshead type unit if you classify or call the crosshead pin a wristpin. However in these two types of units the construction varies to such an extent that there should be a differentiation between the wristpin and the crosshead pin, though for all practical purposes their function is approximately the same. Now I make this statement because the majority of crankcase explosions in crosshead type units is the result of other causes than heating of the crosshead pin.

Also previous to the present war-production of Diesel units, the majority of the larger Diesels was of the trunk type. But during the war the demand for the larger Diesels has run pretty heavy to the crosshead type, especially in the larger marine units. Just what this proportion is I am unable to state, since production of large units for this type of work is more or less a military secret.

As Mr. Faast stated, certain conditions must exist before an explosion in a crankcase can occur. These conditions may vary in different types of Diesels. One fact however is true, that regardless of the type or make of unit, two conditions must be present in any crankcase explosion, one being excessive heat resulting in high temperatures and the other being, that that temperature must be above the lowest flash point of the crankcase lubricant.

Mr. Faast pointed out very clearly the reasons for wristpin heating in trunktype pistons, with the accompanying condition of expanded bosses and other conditions resulting in expansion and scoring or freezing and seizure. He also gave means and methods of preventing such conditions. In the case of the crosshead type, as a rule the crosshead pin is quite free from overheating, the reason for this being in design and method of lubrication. In the crosshead type of unit, the piston heads are usually oil cooled. The cooling of the crosshead and crosshead pin is done by the same oil which cools the piston head, they being in series in this particular part of the lubricating system, so that the same oil passes through both crosshead and piston head. The construction of the crosshead is such that several pounds oil pressure can be maintained in this system at all times, thus assuring sufficient lubricant. This has even been increased in some systems by inserting an orifice in the discharge side of the lubricant line to increase the oil pressure on the crosshead and piston head cooling oil. In some units this works to advantage while in others it does not work out as well, all depending upon design and operating conditions.

A great many crankcase explosions can be laid to other causes, such as overheated bearings, which in turn are the results of many causes, and also by the old "bugbear," blowby, due to ring failure. With conditions as they are on material today, this proposition of ring failure is one which gives engineers and supervisors a lot of headaches. I don't mean to insinuate that it is impossible to get good rings and rings that will give good service. But there are so many conditions with fuels, lubricants, ring, piston and liner material, to say nothing of the added load demands on our units, which vitally affect ring wear that it is almost impossible to anticipate just what will happen to a set of rings as far as length of service is concerned, once you install them.

As an illustration of the above let me cite the following: Not so many weeks ago, upon checking over a unit with his indicator, which was a weekly practice, an engineer discovered that the compression on one of the cylinders of an engine was decidedly below normal. Inspection showed that the rings on this particular piston were worn to about half the normal thickness, with the tension practically gone. This unit had been entirely rerung, a couple of months previous, all pistons having the same make, style, and grade of rings. Further investigation showed that all rings in other pistons were in excellent shape. Since the liners were practically new, with only normal wear and the piston heads all in the same normal condition, there was no apparent reason for the rings on this particular piston to have deteriorated.

Lubrication and the lubricating system were checked, all showing normal operating conditions, yet for some unaccountable reason this set of rings did not stand up. They were replaced and no further trouble indicated. However cases have been known many times over, where ring failure has caused blowby to such an extent, that the tops of the pistons have become overheated, the heat traveling down the piston and causing crankcase explosions. This condition has been one of the major causes for crankcase explosions. Another cause for crankcase explosions has been due to neglect in taking care of lubricating oils. By misuse and improper care the flashpoint has been lowered

. . . *And now please turn to page 82* . . .

* *Chief Engineer, Municipal Water and Light Plant, Hillsdale, Michigan.*

New machines of all kinds will be improved

by the advanced Cast Bronze Bearings

developed for aircraft engines.

In precision, finish, and metallurgical-uniformity

Bunting Cast Bronze Bearings, today, surpass

any bronze bearings ever before produced in volume.

The Bunting Brass & Bronze Company, Toledo 9, Ohio.

Warehouses in principal cities.

10

BRONZE BEARINGS ★ BUSHINGS

★ PRECISION BRONZE BARS

Bunting

Exchange Your Diesel Maintenance Ideas

Repairing Broken Tube in Heat Exchanger

Conducted by R. L. GREGORY

THE following item has been sent into this department, by Joseph White, Superintendent of the Municipal Utilities, of Indianola, Iowa.

"In 1927 our plant was converted from steam to Diesel Units. At the time this change was made there were a lot of debts against the plant, and it was felt that by installing Diesel Units and auxiliaries, considerable saving could be obtained in the way of maintenance, since maintenance would be of little consequence for a few years at least.

"On one Diesel Unit, after several years of operation, we had a tube break in the fresh water heat exchanger for the oil cooler. At the time this happened, our large unit was torn down for repairs. It would take us too long to remove the tube bundle in the heat exchanger, and the peak load would hit us before the large unit could be assembled and gotten back in service, so we proceeded as follows:

"We secured a rod, which would slip inside the erupted exchanger tube, and threaded it on both ends. We ran this down through the tube, placed a soft piece of gasket material over the rod at each end and placed a lead washer on top of that. Then we drew the nuts down tight on each end, thus sealing off that tube from the rest of the bundle. This allowed us to get the unit back in service in a short time. We have used this method several times since on emergency repairs, and while it is a rough method of repair, it saves us removal of the entire tube bundle, which in our case is in a particularly bad location and would require six to seven hours of work. The tube material in this exchanger has been very hard to obtain, and we only recently received the new material. In the meantime we have been able to keep our units in service and operating by this crude method."

The foregoing is just another example of what has been and is being done every day in the way of emergency repairs to keep units operating. In this particular case, or the case of any tube eruption of this type there are several methods of quick repair, possibly the best method being to plug each end of the tube and either braze it over or weld the plug in place at each end. But welding materials and equipment are not always available on the spur of the moment, and then too care must be taken by the particular mechanic doing the welding, to see that expansion and heating does not do further damage.

One thing is certain in any Diesel plant. It is always good insurance to have plenty of repair equipment on hand, materials, etc., which can be utilized in making quick repairs. There are so many places on Diesel units where the unexpected can happen, that a great deal of foresight must be exercised by those in charge in determining what materials should be on hand and available. Just for example let me quote an incident in our experience a short while back, which will illustrate the point.

In most Diesels, especially air injection units, there are several sizes of high pressure copper tubing used, on fuel lines, air lines, lube lines, etc. All of these lines in many instances are of some length, and in order to make a neat arrangement as well as one that is easily accessible for removal in case of repairs, many of these lines are held in place by means of clamps, placed at intervals along the lines to hold them firmly in place and eliminate vibration. Without removing these pipe lines occasionally to ascertain what condition they are in you are almost at a loss to know whether there is any wear at the point of contact with these clamps. Several days ago while operating normally, one of the operators noticed that one of the cylinders was not firing as it should and upon investigation found that the copper fuel line going to that particular cylinder had sprung a bad leak right under one of these clamps. He immediately cut that particular fuel pump out and investigation showed that there had been a rubbing of the fuel line on the clamp and that the fuel line had worn down from this action until it had a large hole on the under side which could not be seen except upon removal of the line.

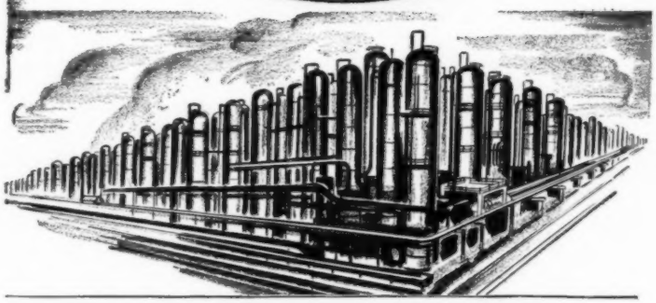
It would have taken some time to bend a new pipe to fit around the various other lines, so it was decided to make a temporary repair. A heavy brass railroad union was procured, abou three quarters of an inch cut out of the li at the worn spot. The threads in each end the union were drilled out so that each end the tubing could be inserted in the unio snugly. Then a brazing torch was used an the ends of the union brazed solidly to th copper tubing. The two pieces were then re placed and the union tightened up and in short time that cylinder was cut back int service and functioning normally again. Tha repair caused no shutdown and allowed time t make a new line for that particular cylinde which was later installed. Of course any heav copper sleeve could have been used, and bee brazed on and would have answered the pur pose just the same.

As Mr. White wrote in a previous letter and the writer feels that he hit the nail right on the head "We have to resort often, to what I term as haywire methods to make repairs and keep our units going." But it is just such "Haywire Methods" that keep up production and cut outages and that is what we must resort to if we keep materials rolling out of our plants for the boys overseas.

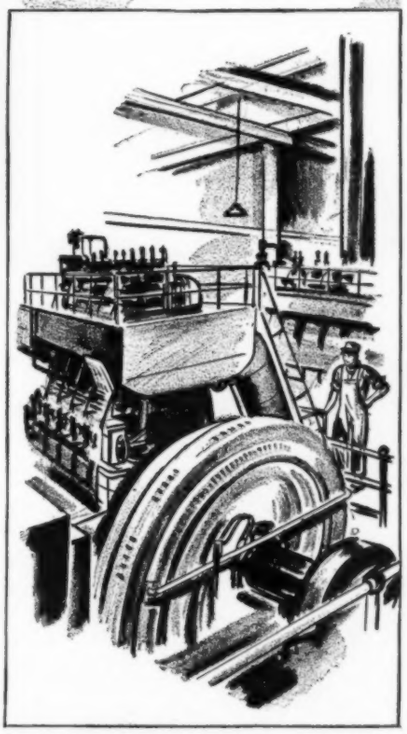
It is a paying proposition to look ahead and anticipate trouble, thus being prepared for it, and a good engineer is always looking and expecting the unanticipated thing to happen and be prepared for it. The same is true of a good maintenance mechanic. He doesn't wait until trouble catches up with him, but in his odd moments when not too busy at regular maintenance he can be making up parts and equipment which he anticipates may come in handy some day. The writer once had a mechanic in his employ who was always making what he called "Gadgets" and these he kept in his "Gadget Cupboard." It contained all sorts of odd shaped tools, chisels, wrenches, fittings, and such like and whenever he got into a quick emergency repair he had the proper tool to do the job in the least possible time. These tools he made in odd moments, but the time spent in making them was well worth it, as it often saved hours of headaches when the emergency arose. That sort of a mechanic was a real maintenance mechanic.

Do you know that . . .

SINCLAIR PRODUCING OIL WELLS IF PLACED END UNDER END WOULD REACH TO THE CENTER OF THE EARTH—MORE THAN 3,500 MILES. SINCLAIR RANKS AMONG THE LARGEST PRODUCERS OF CRUDE OIL.



SINCLAIR'S 10 GREAT REFINERIES, IF MASSED TOGETHER, WOULD COVER AN AREA OF 2,300 ACRES —THE APPROXIMATE AREA OF A CITY OF 100,000 POPULATION. THESE REFINERIES MANUFACTURE A FULL LINE OF QUALITY PETROLEUM PRODUCTS FOR ALL MILITARY, INDUSTRIAL AND GENERAL USES.



A CLEANER DIESEL ENGINE IS MADE POSSIBLE BY THE DETERGENT CHARACTERISTICS OF SINCLAIR TEN-OL 200. THIS IS ONE OF SEVERAL SINCLAIR OILS PREPARED SPECIFICALLY FOR BETTER DIESEL LUBRICATION.

SINCLAIR IS EQUIPPED TO SERVE YOU BETTER!

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

Supervising, *continued from page 78*
to a dangerous degree.

When a piston starts blowing by the rings, good lubrication flies out the window. Regardless of how good a lubricant you may have or the quantity subjected to that piston, the heat of blowby immediately destroys all lubricating qualities, resulting in seizure, which invariably distorts and ruins both piston and liner. The usual sequence of events in such a case are as follows:

First the rings become defective one by one, either breaking up or wearing out and loosing their tension, so that they do not hug the liner walls. This allows the heat of combustion to travel down the piston head and as this heat travels down the piston, the head or upper part of the skirt expands, the more heat, the more expansion. When the piston reaches bottom stroke, the top part of the piston is in contact with the lower part of the liner, at a point where the liner metal is below the cooling compartment, the liner being solid at this point.

With this excessive heat destroying lubrication and the top part of the skirt expanded, the piston starts scoring at this point, as well as the liner, and within a few minutes seizure and trouble are the result.

This friction causes additional heat and one is lucky if they do not run into a crankcase explosion before seizure, as here you have one of the required conditions for such an explosion. Therefore it is always well to keep close watch of your rings. Take periodical cards from your units and watch compression. A drop on any particular cylinder of from 15 to 20 lbs. is an indication of ring trouble. Another good check is to watch the oil temperatures. Any undue increase on any particular cylinder calls for investigation.

Mr. Faast listed several methods to prevent these crankcase explosions and in the next issue of DIESEL PROGRESS, the writer will present further information on this subject and illustrate some of the mechanical devices now in vogue to eliminate such explosions, as well as present indicator cards showing normal operating conditions versus conditions showing ring defects. He will also discuss the question of crankcase ventilation.

You can often use a smaller engine or motor with a TWIN DISC HYDRAULIC COUPLING

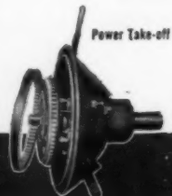
With ordinary gear transmissions the power required for the driven unit must always allow for PEAK LOADS at some point in the work cycle. With most equipment, it is starting the load that often threatens to stall the engine or motor.

The use of a Twin Disc Hydraulic Coupling allows the engine or motor to operate at an efficient rpm. during the entire work cycle. Stalling is prevented and thus it is often practical to use a smaller engine or motor than would otherwise be required.

Have you fully considered this advantage of a Twin Disc Hydraulic Drive? Why not send for Bulletin 136 which gives the complete details about this and five other important advantages which Twin Disc Hydraulic Couplings provide? TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).

Reduction Gear

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES



Power Take-off

Marine Gear

SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

Aircraft Accessories Corp. Becomes Aireon Manufacturing Corporation

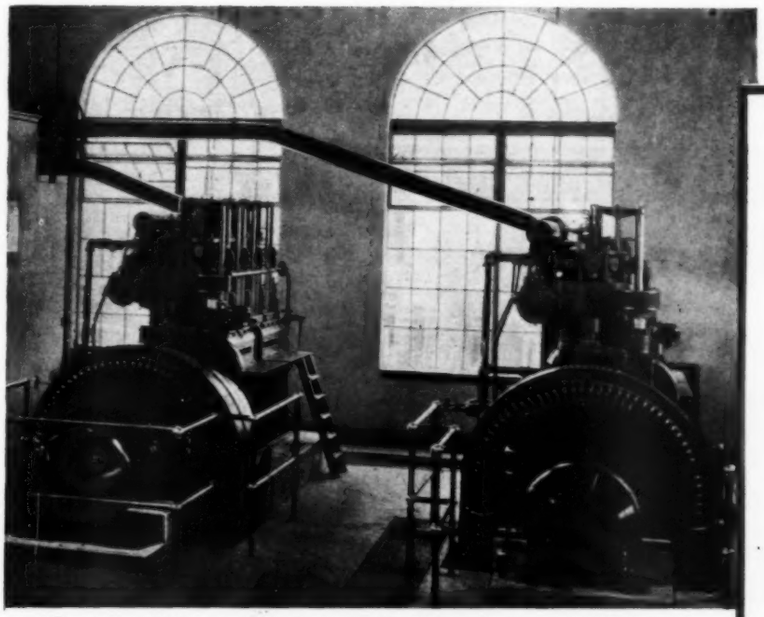
STOCKHOLDERS of Aircraft Accessories Corporation voted on December 15th to change the name of the company to Aireon Manufacturing Corporation.

The company's manufacturing activities have long since expanded beyond the limitations implied in the name Aircraft Accessories Corporation, according to R. C. Walker, President, who further stated that, while Aireon contemplates continued substantial production of aircraft and electronic equipment, it has developed a number of new products which it is prepared to manufacture and market as soon as materials are released.

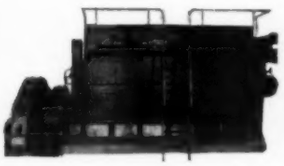
Founded in 1937 as a West Coast distributor of aircraft parts and accessories, the company soon dropped its accessory franchises and devoted itself entirely to the design and manufacture of hydraulic actuating equipment.

In 1939 the company established an electronics division at Kansas City which was expanded into one of the country's largest manufacturers of radio equipment for the airlines and the armed services.

A GREAT LITTLE CITY MAKES A TIDY PROFIT



Two 4-cycle, 300 hp., mechanical injection, Worthington Diesels installed in Kenyon in 1932, and the latest addition, a 750 hp. Worthington unit which more than doubled plant capacity in 1941



10 YEARS—AND NEVER A STUCK RING!

Successful pressure lubricating system of Worthington Diesels contributes to low repair costs through the years. At Kenyon, each 300 hp. engine has run an average 5000 hours a year for 10 years, using the original valves, bearings and cylinder liners, and without a single breakdown or major repair.

Civic Improvements in Kenyon, Minnesota, Result from 10 Years of Progress With Worthington Diesels

Kenyon, one of the best lighted, progressive little cities in Minnesota made $146,757.28 net profit between 1932 and 1941 on its Diesel-powered municipal plant—thus paying for the entire investment in Worthington Diesels with a comfortable margin for other civic projects.

Worthington, your partner in power progress, both for economical power and for wider distribution of power-using equipment, invites you to consider these *typical* figures as an indication of what you also can accomplish with Worthington Diesels.

Write for "Ten Diesel Years at Kenyon, Minnesota," an article reprinted from a leading Diesel power publication. Worthington Pump and Machinery Corporation, Buffalo Diesel Engine Division, Buffalo, N. Y. District offices in principal cities.

Power Progress in Kenyon, Minnesota

Average fuel return	11 kw. hrs. per gallon
Average annual engine repairs . . .	$175
Total kw. hrs. generated	1,305,120
Total costs per kw. hr. 1941	1.84 cents
Average sale price per kw. hr. 1941 .	3.70 cents

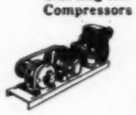
WORTHINGTON *BEHIND THE NAME* WORTHINGTON

YOUR PARTNER IN POWER PROGRESS

WORTHINGTON-BUILT AUXILIARIES

DE4-1

Starting Air Compressors



Cooling Water Circulating Pumps

Fuel Oil Transfer Pumps

Evaporative Condensers

Diesel engines, 150 to 2,600 hp. . . . Gas Engines, 175 to 2,880 hp. . . . Convertible fuel engines, 150 to 1,730 hp.

Briggs Clarifier Adds Distributors

WITH a further view toward strengthening its industrial distributor organization, the Briggs Clarifier Company has made two recent distributor appointments. These are: the M. N. Dannenbaum Company, 2409 Wayside Drive, Houston 12, Texas, whose territory will be East Texas and the Gulf Coast; and McGregor & Werner, Inc., 1411 20th Street, N. W., Washington, D. C., whose territory will be Maryland, Delaware and the District of Columbia.

Tractor Drivers Awarded Distinguished Service Crosses

FROM France comes this story of D-Day gallantry by two bulldozer operators. The soldiers, Privates William J. Shoemaker and Vinton W. Dove, part of an Engineer Combat battalion, working in shifts with their bulldozer while it was a specific target for intense mortar and cannon fire, dragged capsized wheeled and trackpropelled vehicles out of the surf. Then, with the battle raging furiously about them, they set out in their unprotected machine to clear obstructions from the beach exits. Th dangerous objective accomplished, they smashe road blocks and filled in gaping anti-tank tra while geysers of earth from bursting shel rained down on their Diesel tractor, a "Cate pillar" equipped with bulldozer. In the wor of the official citations, "Their courageous a tions permitted vehicles and armor to move o in support of the infantry troops."

Privates Shoemaker and Dove, who, with the Diesel bulldozer, distinguished themselves o D-Day.

Privates Shoemaker and Dove received the sec ond highest decoration awarded by the Arm from Lieutenant General John C. H. Lee, Com manding General, Communications Zone, ETO while the entire brigade, standing at attention looked on.

Before entering the Army, Pvt. Shoemaker wa employed by the Harrison Construction Com pany, Pittsburgh, Pa., and Pvt. Dove was a con struction Co., Washington, D. C.
struction foreman for the C. M. & H. Con

"Tornado In A Box"

THE Gas Turbine makes its motion picture debut in a film released by Allis-Chalmers Mfg. Co. entitled "Tornado in a Box." Explained in motion pictures for the first time are the development and operation of this unit. Taking a cue from the popularity of the gas turbine, the movie unfolds the story of the Gas Turbine in a manner which will make its principle readily understandable to the largest possible audience which could be interested in its potentialities. At the same time, the film frankly indicates that a great deal more of the tremendous engineering effort already applied must still be put into Gas Turbine development before such potential success can be achieved. The film, which contains no advertising, is being loaned free to any industrial or engineering group interested in showing it, and permanent prints may be purchased. It is a 16 mm. film for use on sound projector's only.

ROSS

STANDARD COOLERS

Wherever oil, water or other fluids are circulated for heat removal, there's a Ross way of assuring **highest cooling efficiency for your own conditions.** First, have a Ross engineer analyze your individual problems. Second, avail yourself of a standard Ross cooler (each consists of standard parts, specially assembled to meet your own requirements).

For helpful information on large capacity units, write for Bulletin 5322. For small capacities, write for Bulletin 4922.

ROSS HEATER & MFG. COMPANY, INC.

Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

1425 WEST AVE. BUFFALO 13, N. Y.

What to do about Rust?

Make this Test

Immerse any rusty nail in a small quantity of Cities Service Rust Remover. If badly rusted, allow to remain for several minutes. You can actually see the rust dissolve.

See the Results

Remove nail and wipe dry with cloth or tissue. Note the complete absence of rust and the way the original surface reappears.

CITIES SERVICE RUST REMOVER has been tested for four years throughout a small, highly industrialized area in the East, where it has earned a unique reputation for performance. RUST REMOVER is a clean, clear liquid, practically odorless, non-inflammable, easily applied, and harmless to handle by those not allergic to specific chemicals. It is fast-acting, and, although heating somewhat accelerates results, general application is recommended at normal temperature (60°-90°F.). RUST REMOVER is effective on chromium, copper, aluminum, steel and iron.

5 Big Advantages

1. Non-Inflammable
2. Harmless to Normal Skin
3. Makes Metals Chemically Clean
4. Removes Rust by Chemical Action
5. Free from Muriatic, Sulphuric, Nitric and Oxalic Acids or Cyanide.

CITIES SERVICE OIL COMPANY
NEW YORK · CHICAGO

ARKANSAS FUEL OIL COMPANY
SHREVEPORT, LA.

See a Free Demonstration of Rust Remover on Your Own Equipment.

(Available only in Cities Service marketing territory EAST of the Rockies.)

MAIL THIS COUPON TODAY!

CITIES SERVICE OIL COMPANY
Room 193
Sixty Wall Tower, New York 5, New York

Gentlemen: I'd like to test RUST REMOVER on my own equipment FREE OF CHARGE. Send me details.

Name.....

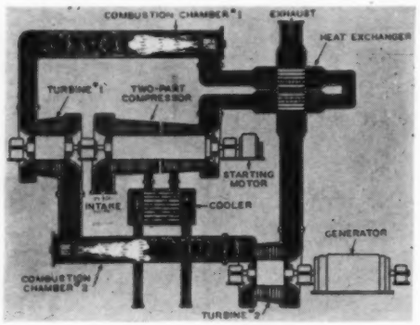
Company.....

Address.....

City..... State.....

How the Gas Turbine works is illustrated in the accompanying scene from the motion picture, "Tornado in a Box." Heat—in this illustration, from the blowtorch—increases the pressure of the air—here, in the humidor—and the heated air, seeking to expand, returns to atmospheric pressure—in this case, through the pipe which protrudes from the humidor—and performs work—spinning the pinwheel, here.

Three engineering expedients for increasing the efficiency of the Gas Turbine are shown in the accompanying sketch which is reproduced from the educational motion picture, entitled "Tornado in a Box." The heat exchanger increases the turbine's efficiency by making use of the 600 degrees of heat coming out of the exhaust. The air is drawn in through the heat exchanger, where the hot exhaust heats it to 475 degrees, instead of entering directly into the combustion chamber at 375 degrees. Thus heat which would otherwise be wasted is actually reclaimed for use in the cycle. Then the air enters the combustion chamber where fuel is added to bring it up, in this instance, to 1000



degrees. Less fuel is required to heat the air from 475 degrees to 1000 degrees than from 375 degrees to 1000 degrees. Since output is the same, even though less fuel is required, the thermal efficiency is increased. The gas is exhausted at 500 degrees. Use of a second combustion chamber and turbine is another way of increasing efficiency.

The first, or high pressure, turbine furnishes power only to the compressor. The exhaust from the first turbine goes through an additional combustion chamber where it is reheated to inlet temperature of the high pressure turbine. The exhaust is then expanded through the second, low pressure, turbine. As a result the total power supplied by the second turbine can be put to work. Then the exhaust is sent through the heat exchanger. Cutting down the need for 5000 horsepower to run the compressor is a third method of increasing efficiency.

A compressor is designed in two parts. When air comes in the first part, it is partially compressed. However, even partially compressed air tends to heat and tries to expand, so it is run through a cooler to reduce heat and volume. The exhaust from the cooler is sent through the second part of the compressor and is stepped up to desired pressure with less effort.

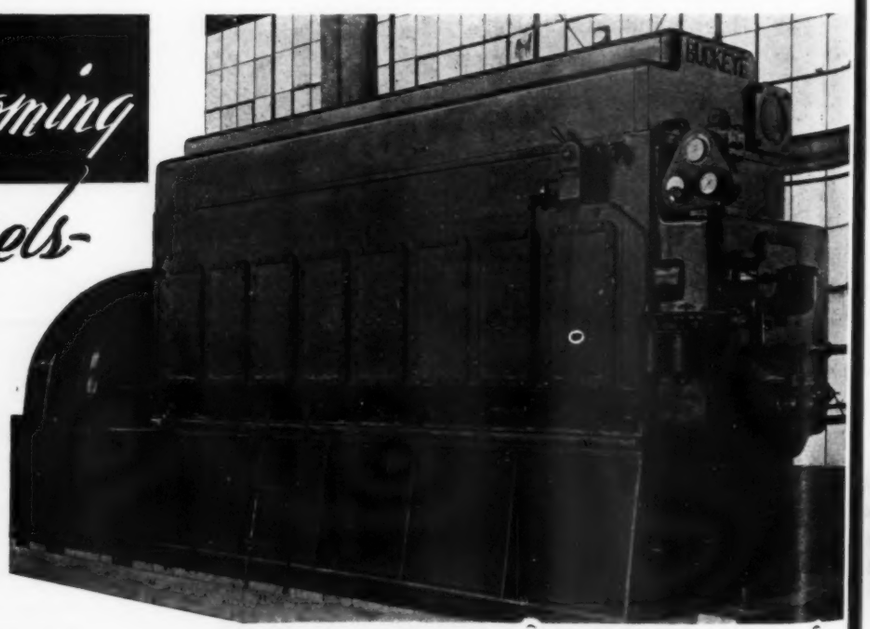
To borrow or purchase "Tornado in a Box" or the other films, write the Allis-Chalmers Mfg. Co., Milwaukee 1, Wisconsin.

Better days are coming

Buckeye Diesels-

Buckeye Diesels built long before the war are today serving hundreds of war industries dependably and economically. Many of these industries need additional prime movers now—many others are waiting for better days to install their own power equipment. Yes, most of them must wait until we have filled the requirements of the Government—then will come better days and Buckeye Diesels will again be available to power—

Chemical Plants
Mines and Quarries
Textile Plants
Ice Plants
Rock Crushing Plants
Food Products Plants
Municipal Power Plants
Municipal Waterworks
Machine Tool Plants
Cold Storage Plants
Furniture Factories
Cotton Gins



Direct Drive or Electric Units 75 H.P. to 960 H.P.

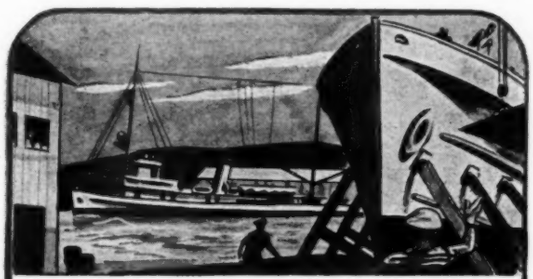
Engine Builders Since 1908

Be Profitwise and Dieselize with Buckeyes

THE BUCKEYE MACHINE COMPANY ..... LIMA, OHIO

The navy had a tough problem:

1. In 1940 and early 1941, the U. S. Navy had the problem of getting hundreds of patrol and escort vessels built—*almost overnight.* But who could build them? The big shipyards were working to capacity on big ships. The Navy outlined the problem to the small shipyards. And . .



The small shipyards took it on:

2. Many small yards had gone practically out of business. Others had been building a few small non-military craft, or were engaged only in repair work. Equipment had deteriorated, skilled workers had left. But small shipyards all over the country accepted the challenge. You bet they could build PC's, YN's, YT's, YMS's—*and in a hurry!*

Yards were rebuilt. New equipment was installed. Skeleton forces mushroomed. Keels were laid—*speed* was the thing! And yard managements were swamped with the thousands of details relating to construction of unfamiliar types of ships. It was a tough problem. And Sperry feels deep satisfaction that . . .

Sperry service engineers helped solve it:

3. Sperry equipment—including Electro-Mechanical Steering Systems and Gyro-Compasses—was going into many of these new ships. *And Sperry service engineers helped solve the problems encountered in engineering this equipment into the ships.*

In visiting scores of yards tucked away in small coastal harbors and tidewater inlets, the Great Lakes and the Ohio and Mississippi rivers, Sperry men found that they could be of help on many another problem. "What about this gear box? What about that quadrant arrangement? Or this rudder bearing?"

Sperry service men were, in effect, roving consulting engineers to an industry which tackled a mighty tough assignment and accomplished it despite tremendous odds. Sperry's years of familiarity with Navy and Marine problems helped many a shipyard meet its tight schedules.

• *The small shipyards met our Navy's challenge. Today, patrol and escort vessels by the hundreds are ridding the seven seas of submarines, and are clearing lanes through mine fields to invasion beaches.*

Sperry Gyroscope Company INC.

GREAT NECK, NEW YORK • DIVISION OF THE SPERRY CORPORATION

GYROSCOPICS • ELECTRONICS • AUTOMATIC COMPUTATION • SERVO-MECHANISMS

New Bulletin Describes Triple Service Products

ALCO Products Division of American Locomotive Company has announced a new bulletin titled, "Alco Triple Service," featuring Prefabricated Piping, Pressure Vessels and Fabricated Plate Work and Heat Exchange Equipment. Illustrations throughout the bulletin show various types of the above products and include numerous line drawings showing the construction of these products and how they function. Dimensional tables are included and simple diagrams illustrate methods of specifying type and size designations. A combination chart shows shell thickness and flange quality for pressure vessels up to 300 psi. A copy of Bulletin No. 1034 will be mailed on request to Alco Products Division, American Locomotive Company, 30 Church St., New York 8, N. Y.

New Blackmer Pump Company Manager

FRED T. KENNEDY has been appointed General Manager of the Blackmer Pump Company effective December 1, 1944. Mr. Kennedy, until recently, has been connected with the War Production Board in Washington, D. C., and will move to Grand Rapids early in December to assume full charge of all Blackmer Pump Company operations.

D.E.M.A. To Hold West Coast Educational Meeting

A CLOSE-UP picture of Diesel engine manufacturing on the Pacific Coast will be shown Feb. 8 to engineering instructors of western universities, who will assemble in San Francisco for a tour through the Bay area.

The educators face a busy day, which will include trips through the Enterprise Engine & Foundry Co. of San Francisco, and Atlas Imperial Diesel Engine Co. and Union Diesel Engine Co. of Oakland.

Also on the day's program is a lunch at Oakland, to be followed by a discussion period during which educators will tell how the manufacturers could help them in the way of providing films, slides, literature and engine parts for classroom instruction. The manufacturers, in turn, will describe the type of graduate who is best equipped to enter the Diesel industry.

Among those who will represent the manufacturers are Charles G. Cox, vice president of Enterprise, and Roy A. Hundley, chief engineer; F. H. Kilberry and G. F. Twist, president and vice president respectively of Atlas; and O. H. Fischer, president of Union.

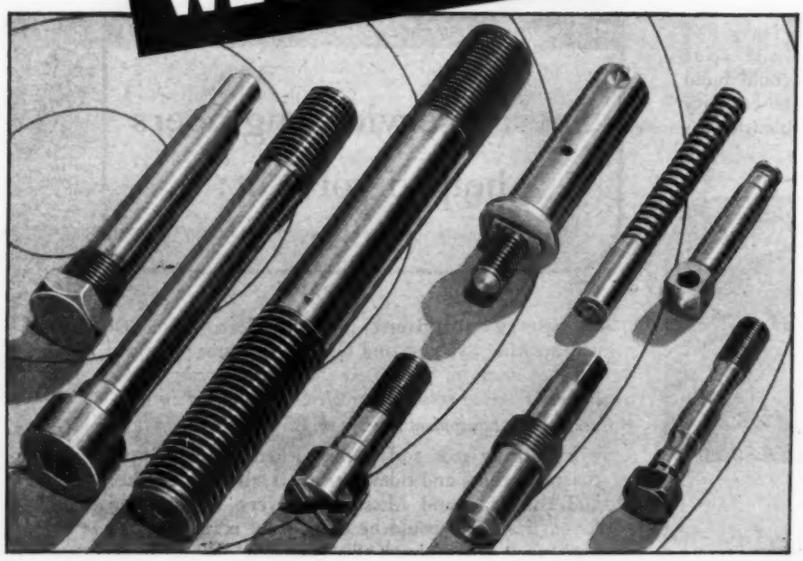
California universities which have been invited to send representatives are Stanford, Santa Clara, University of California, California Institute of Technology and University of Southern California. Invitations have been sent also to University of Idaho, University of Washington, University of Nevada, State College of Washington and Oregon State College.

The day's session is being sponsored by Diesel Engine Manufacturers Association, a national organization, which will be represented by Harvey T. Hill, executive director, and Prof. Robert B. Rice, educational consultant.

Diesel Generating Plants Are Mounted on Skids For Overseas Use

THE first "sled-borne" Diesel generating plants —designed to supply emergency current used by U. S. Army Engineers in meeting military and civilian needs in occupied countries—are

YOU DESIGN 'EM
WE'LL MAKE 'EM



Versatile, exacting, efficient—yes, we admit that we are all of these and more . . . In developing a source of supply for screw machine products, you can counsel in confidence with The Chicago Screw Company.

For almost three-quarters of a century we have excelled in producing precision-made screw machine products. The "Know How" accumulated over these long years of experience has resulted in an organization that is exceptionally well qualified to help you with your present problems and post-war developments.

If your requirements run into hundreds or millions of pieces, regardless of size, shape or material—*you design 'em, we'll make 'em.*

THE CHICAGO SCREW CO.
ESTABLISHED 1872
1026 So. Homan Avenue Chicago 24, Ill.

Gaining Ground

GENERAL MACHINERY CORPORATION

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS COMPANY • THE HOOVEN, OWENS, RENTSCHLER CO. • GENERAL MACHINERY ORDNANCE CORPORATION

being supplied by a Graham-Paige Motors subsidiary.

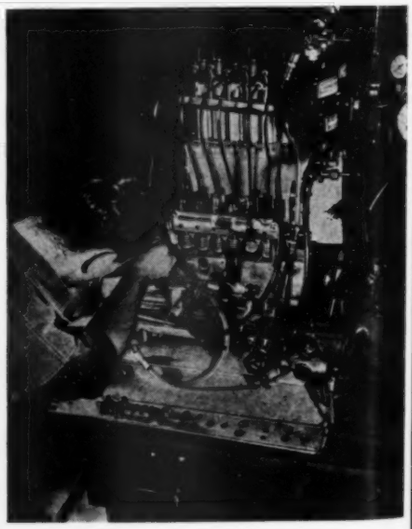
Generating units of 246 to 640 horsepower are being mounted on welded steel platforms, or "skids," produced at the Warren City Manufacturing Company. The skids permit immediate operation of the power plants upon arrival, without using prepared bases at their destinations.

Transported on trailers of the tank-recovery type, the complete units weighing up to 33½ tons can be quickly hauled into position by tractors working in tandem. They will serve as emergency "stop-gaps," cutting in on existing power lines to produce current for water supply, sewage disposal and a small amount of illumination until regular facilities can be restored.

Compar Transparent Tubing Accelerates Diesel Pump Tests

THE Durham Company of New York maintains a completely equipped service station which is manned by personnel trained in the factory of the American Bosch Corporation. Here Diesel fuel injection pumps receive thorough overhaul or periodic adjustment, with testing done on a specially devised American-Bosch stand which measures, under simulated engine injection conditions, the exact and equal delivery of fuel to all cylinders. This modern test stand also indicates any variation in the speed controlled by the governor which coordinates the fuel delivery rate to the speed or load of the engine.

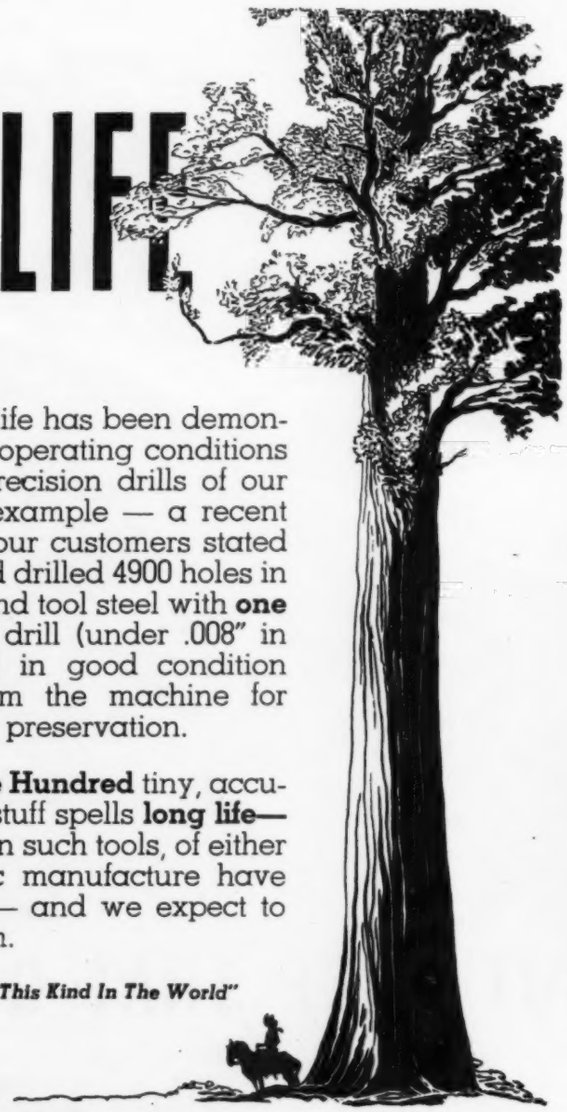
On these American-Bosch test stands is an innovation which is creating considerable interest because, for the first time, it affords facilities for quickly determining whether any air is flowing with the fuel into the supply pump and on into the sump of the injection pump. This innovation is the installation, for all low-pressure fuel connections on the test stand, of a transparent, oil-resistant tubing made of compar, a vinyl resin derivative developed by Resistoflex Corporation. Completely immune to oil, this flexible rubber-like hose assembly carries the light-grade highly refined testing oil from supply tanks to the transfer pump and through the final-stage filter, thence to the sump of the injection pump.



Testing of Diesel fuel injection pumps is made a visible operation at the Durham Company, New York, through the installation of transparent Resistoflex compar tubing on the American-Bosch special test stand.

An injection pump, expertly overhauled, goes onto the stand for testing. Quickly the flexible transparent tubings are attached to carry the oil necessary for testing. The stand is put into operation and, at a glance through the transparent tubing, the operator knows if the proper amount of oil is being fed to the pump. If it is not, bubbles of air show up in the transparent

LONG LIFE



Exceptionally long life has been demonstrated under shop operating conditions with microscopic precision drills of our manufacture. For example — a recent report from one of our customers stated that an operator had drilled 4900 holes in an alloy of spring and tool steel with **one** drill. Also that the drill (under .008" in diameter) was still in good condition when removed from the machine for photographing and preservation.

Four Thousand Nine Hundred tiny, accurate holes in tough stuff spells **long life**— much longer life than such tools, of either foreign or domestic manufacture have ever before given — and we expect to further improve them.

"The Only Business Of This Kind In The World"

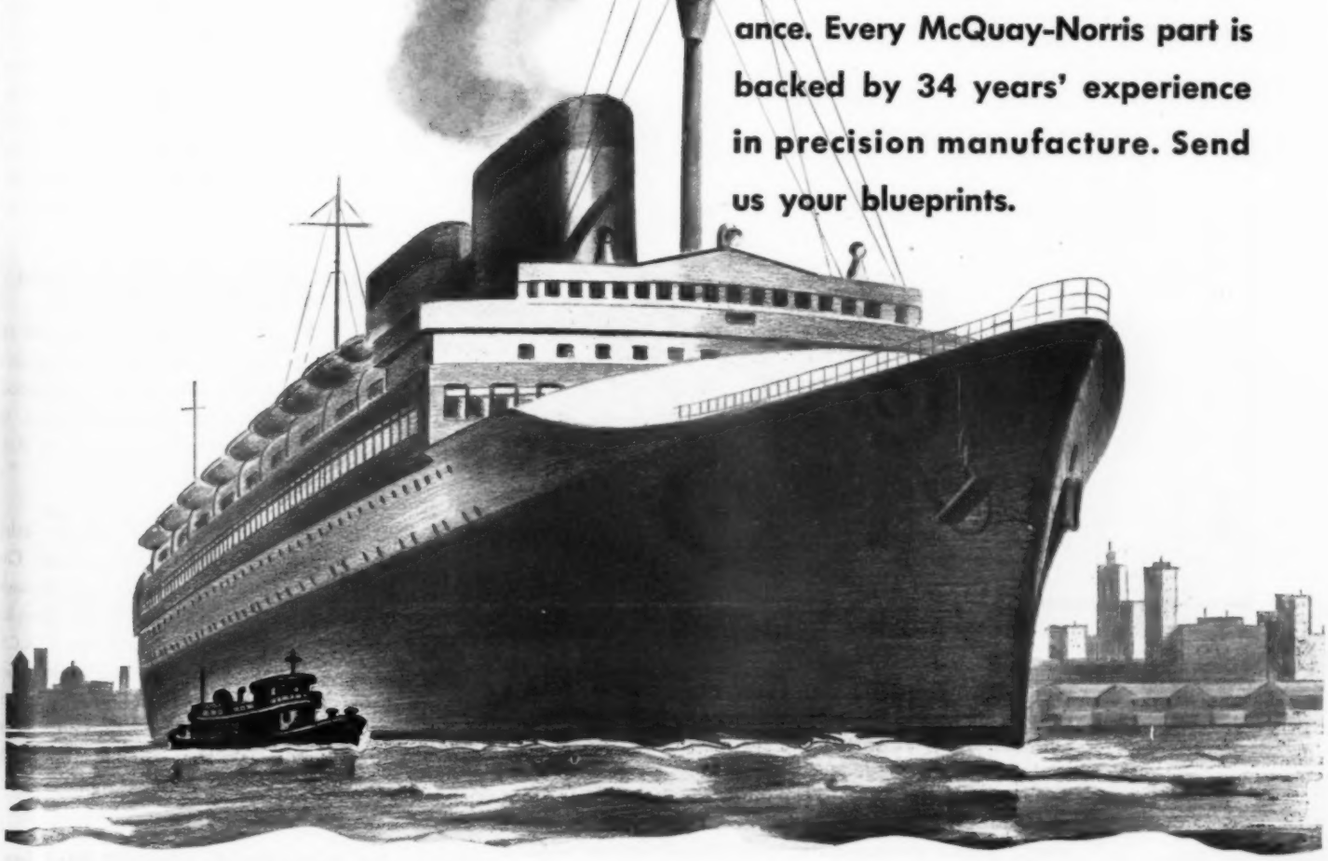
National Jet Company

115 MILTON PLACE CUMBERLAND MARYLAND

Parts built for Toil and Sweat

McQUAY-NORRIS
ALTINIZED
PISTON RINGS

Diesel engines have tough work to do . . and tough work demands tough precision parts. That's why, on every Diesel front, you'll find McQuay-Norris parts making an outstanding record for efficient, dependable, economical performance. Every McQuay-Norris part is backed by 34 years' experience in precision manufacture. Send us your blueprints.



ARMY E NAVY

Awarded to two plants McQuay-Norris Ord. Management Division

McQUAY-NORRIS
MANUFACTURING COMPANY
ST. LOUIS, MO.

TIME TESTED McQUAY NORRIS AUTO PARTS PROVEN IN SERVICE

PRECISION WORKERS IN IRON, STEEL, ALUMINUM, BRONZE, MAGNESIUM

compar line. Immediately the operator knows that an air leak in the intake line is the cause of the trouble. The operation is halted; connections are tightened and in a minute or two a condition which formerly was difficult to overcome is located and corrected easily. If the operator is in doubt whether fuel is flowing properly, it is a simple matter to bleed air into the transparent intake line and watch the bubbles flow through all the compar tubing. By manually operating the transfer pump which is used for priming the Diesel engine, it is easy to observe the effectiveness of each stroke as the bubbles and fuel move through the transparent tubing.

The Modern Gas Turbine

By R. TOM SAWYER

"TOM" SAWYER, M.E., E.E., Engineer, Diesel Equipment, American Locomotive Company and Chairman, Co-ordinating Committee on Gas Turbines, A.S.M.E. and widely known throughout the Diesel fraternity announces publication of his new book, THE MODERN GAS TURBINE. With both professional and popular interest in the Gas Turbine running high, this is a most timely and informative volume, covering, as it does, the whole history of this power device from its earliest inception down to the present moment in easy-to-read style, profusely illustrated. With characteristic thoroughness but without stuffy technical treatment, the author covers his subject under the following chapter headings: Fundamentals, Early Inventions and History; The Gas Turbine Using Diesel Engine Exhaust Gases, As a Supercharger or as a Prime Mover; Combustion Gas Turbine Gas Calculations and Efficiencies; The Gas Turbine In Industry—In Marine Service—In Locomotives; The Exhaust Turbocharger On Aircraft Engines; The Gas Turbine as an Aircraft Prime Mover, Including Jet Propulsion. Everyone wanting an understanding of this interesting new prime mover and vision of its place in the future will welcome "Tom" Sawyer's splendid work, published by Prentice-Hall, Inc., 70 Fifth Avenue, New York, price $4.00.

Samuel W. Fordyce III to Head Railway Equipment Division

APPOINTMENT of Samuel W. Fordyce III as General Manager of the Railway Equipment Division of Aireon Manufacturing Corporation, formerly Aircraft Accessories Corporation, of Kansas City was recently announced by Randolph C. Walker, President.

Mr. Fordyce is widely known in railway circles, having been associated with the Kansas City Southern and the Louisiana and Arkansas Lines. During 1942, on a year's leave from his position as Assistant to the President of K.C.S. he also served as Assistant Director in the Office of Defense Transportation. In his new position, Mr. Fordyce will direct the introduction of Aireon's radio telephone equipment for railroads which permits constant communication with and between moving trains.

Joe Staff Heads Fuel Oil Division

PETROLEUM Solvents Corporation has announced the formation of a Tank Solvents Division. This department was created for research purposes, to supply technical information and develop new products necessary to overcome problems that may arise in connection with tanks. Mr. Joe Staff has been appointed head of the new Tank Solvents Division.

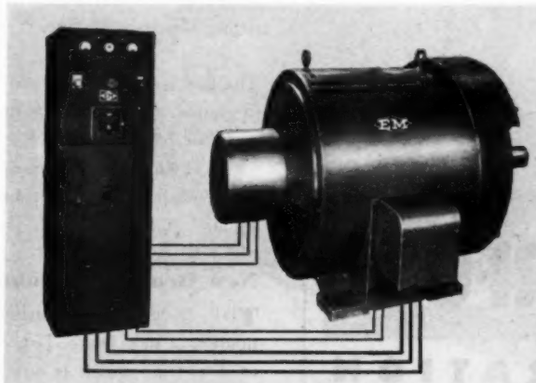
Ninety-two years is a long time — yes, not far from a century of Engine Building Experience — to back up the Fulton Diesels we shall build for the peace-time World. In better than nine decades we have learned how to design and build Diesels for long, carefree, dependable and profitable service — with nothing left to guess work. These characteristic qualities of Fulton Diesels have been demonstrated in practically every type of stationary application — continuously for many years.

625 H.P. to 2000 H.P.

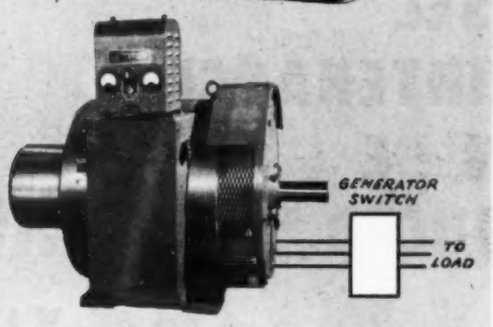
FULTON IRON WORKS CO.

• ST. LOUIS • MISSOURI •

IT SOLVES YOUR VOLTAGE REGULATION PROBLEM



STANDARD Generator with *Synchrostat Voltage Regulator mounted on control switchboard. Swing-door construction of regulator permits easy inspection.**



"PACKAGED" Generator with *Synchrostat Voltage Regulator and meters. A compact unit, factory-assembled and connected. Only 3 connection wires are required through switch to load.**

For smooth, rated voltage from your A-C generators, here's a simple, low-cost, automatic voltage regulator of exceptional efficiency and rugged dependability . . . the E-M *Synchrostat**.

Designed for generator-top mounting, with meters, in a NEMA Class I enclosure, or for semi-flush mounting on generator switchboards, the *Synchrostat** offers many practical advantages. Here are examples:

PREVENTS LOW VOLTAGE. Despite load variations, heavy or light, the E-M *Synchrostat** operates quickly to restore voltage to normal. It accurately maintains average rated voltage of the generator. This assures your electrical equipment of constant, dependable electric power.

COMPENSATES FOR ENGINE SPEED. If engine speed drops, the *Synchrostat** compensates (within limits), to keep voltage at its rated value.

ALLOWS INCREASE IN VOLTAGE. With a *Synchrostat** your generator voltage can be increased or otherwise adjusted . . . for example, to compensate for drop in voltage in a long line.

Write for prices and data in Publication 176.

ELECTRIC MACHINERY MFG. CO.
Specialists in Synchronous Generating Equipment Since 1903
Minneapolis 13, Minnesota

E-M

SYNCHROSTAT* Voltage Regulator ADVANTAGES

1. HIGH SPEED RESPONSE
Promptly restores generator voltage to normal with rapid, positive response to load changes.

2. SPEED COMPENSATED
Holds rated voltage at 5% above or below rated engine speed.

3. RUGGED CONSTRUCTION
Has only one moving part. Simple and efficient.

4. VIBRATION-PROOF
Withstands reasonable external vibration; relay has no pivots or bearings to wear out or jar out of order. Well suited for mounting on generator.

5. EASY INSTALLATION
Takes small space and has minimum of electrical connections.

*REGISTERED TRADEMARK

GOOD POWER PLANTS DESERVE E-M GENERATORS

HIGH-SPEED LOW-SPEED "PACKAGED" ENGINE-TYPE WATERWHEEL

A2006

Colored Sound Slide Film Portrays History of American Merchant Marine

A PANORAMIC story of the American Merchant Marine from the days of the clipper ships down to the present, told by a full color sound slide film, has been prepared by Westinghouse. It is a story of the part maritime power has played in the growth of this great nation; a story of significance to everyone interested in America's future. The theme of this half hour long film is expressed in its title—"This time . . . let's keep our Merchant Marine."

The story begins in the glorious days when American ships carried nine-tenths of the nation's foreign trade. It then records the tragic decline of the American Merchant Marine until 1910 when only one-tenth of the nation's foreign trade was being carried under the American flag. Then came the first World War; the frantic effort to regain maritime power through an emergency shipbuilding program; the turning of the tide of the war with ships which were left to rust and rot when peace came.

The few years between the two great wars s America's Merchant Marine decline again un only 25 per cent of the nation's foreign tra was carried in its ships. Again war necessitat a frantic shipbuilding program, but suppor this time by the Merchant Marine Act of 19 and a competent Maritime Commission; aga America's Merchant Marine is strong as a r sult; this time it comprises the greatest fl of ships ever possessed by any nation. Mo important than ever before is the econo and military security which this fleet offe and for this reason it must be preserved a maintained. America's future depends upon strong Merchant Marine.

The film is available for showing to any gro interested. Get in touch with the nearest We inghouse office, or write P. O. Box 868, We inghouse Electric and Manufacturing Compa 306 Fourth Avenue, Pittsburgh 30, Penn vania.

HOW YOUR DIESEL MAINTENANCE CAN BE REDUCED.....by KORFUND

VIBRATION CONTROL

Perfect balance and frictionless operation are beyond the reach of practical engineering. Unavoidable vibrations will persist in all machines. When a Diesel engine is rigidly bolted down, its own vibration produces strains in the engine and in its foundation.

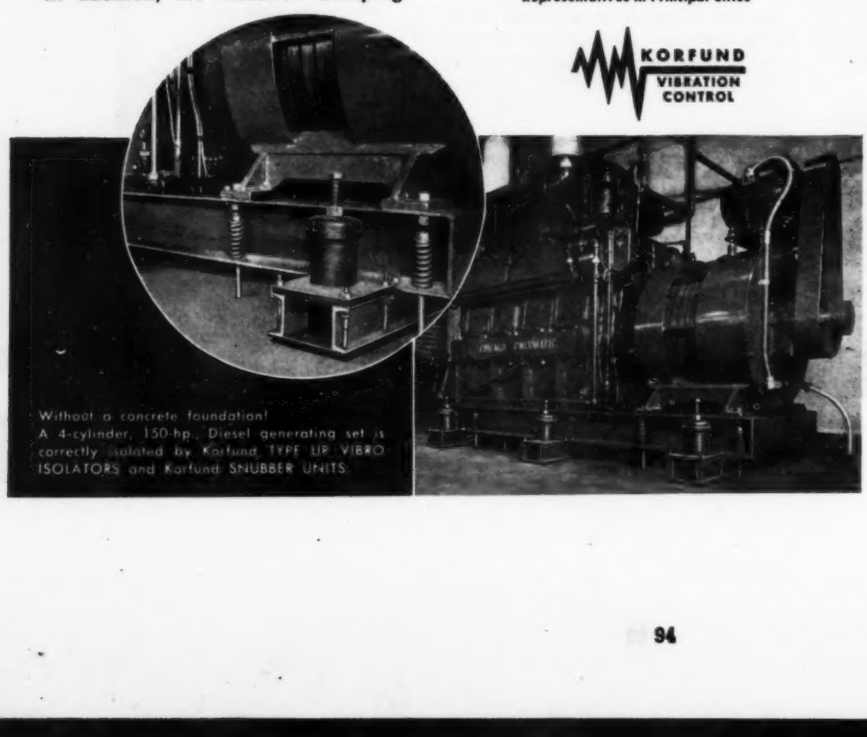
But by resiliently mounting your Diesel on Korfund Vibro Isolators, it is permitted to yield to its vibrational stresses. Longer life and reduced maintenance are assured.

In addition, the vibration damping efficiency of Korfund equipment makes possible the use of lighter foundations and substructures for engine installation.

Korfund engineers with more than forty years of vibration control experience are prepared to analyze your vibration problem and specify the type of installation that will solve it most effectively. Write for descriptive catalog.

THE KORFUND COMPANY, Inc.
48-28 Thirty-second Place, Long Island City 1, N. Y.
Representatives in Principal Cities

KORFUND VIBRATION CONTROL

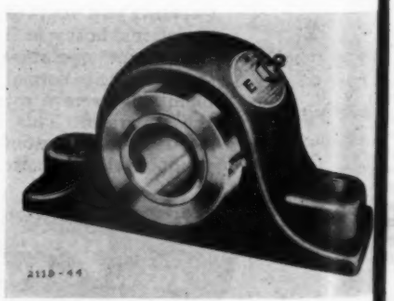


Without a concrete foundation! A 4-cylinder, 150-hp., Diesel generating set is correctly isolated by Korfund TYPE UP VIBRO ISOLATORS and Korfund SNUBBER UNITS.

New Bearing Announced

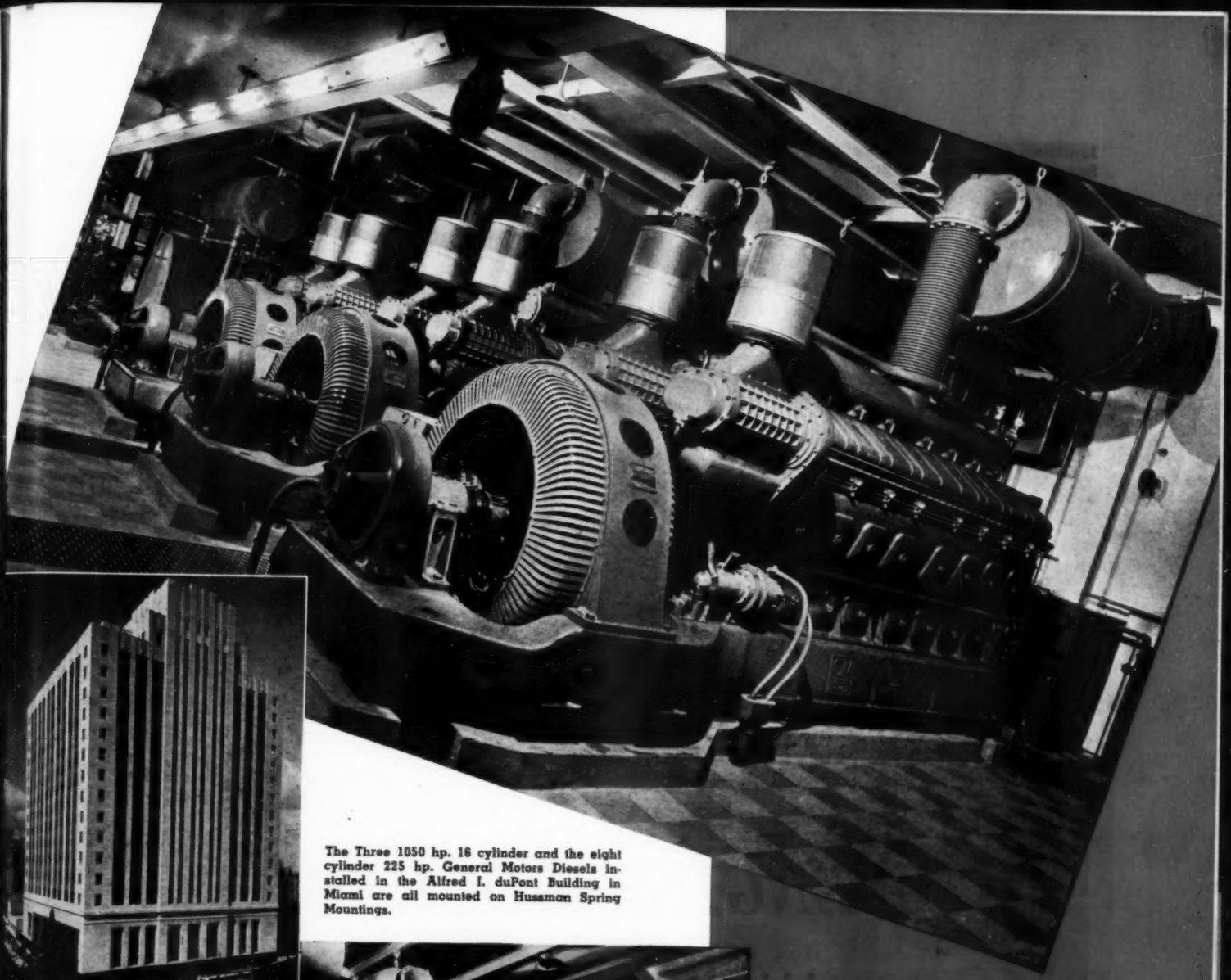
THE Dodge Manufacturing Corporation a nounces a new Dodge-Timken Bearing kno as Type "E" which is now available in bo pillow blocks and flanged units. This bear was engineered to provide all features neces for satisfactory performance under normal se ice conditions at a low price which has be made possible by use of modern machine

It is designed to give 30,000 hours or more service under conditions for which it is adap as determined by use of standard selecti tables applying to the Dodge-Timken li

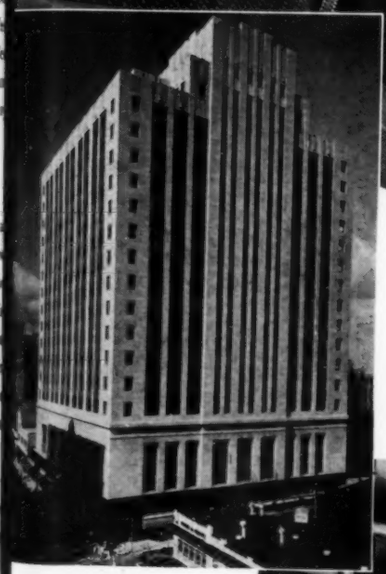


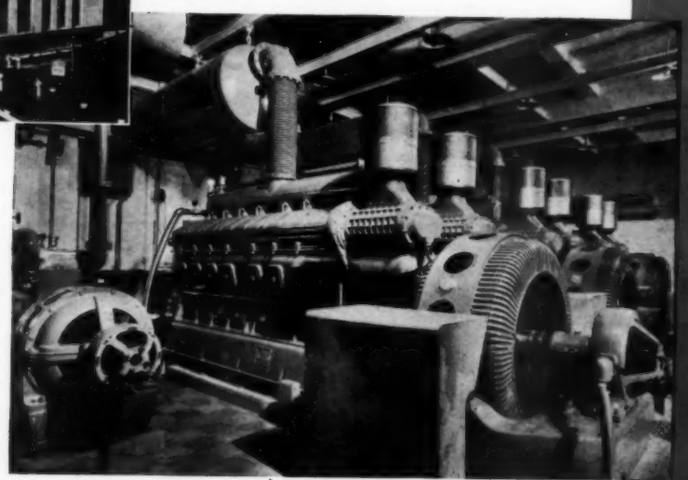
Dodge-Timken Pillow Block Bearing.

The method of fastening to shaft is simple a effective. On each end of the extended in race is a steel collar having two headless screws spaced 120° apart and extending thro clearance holes in the inner race to the sh These four set screws provide a positive lo For full particulars write Dodge Manufactur Corporation, Mishawaka, Indiana.



The Three 1050 hp. 16 cylinder and the eight cylinder 225 hp. General Motors Diesels installed in the Alfred I. duPont Building in Miami are all mounted on Hussman Spring Mountings.





THREE thousand three hundred seventy-five horsepower of Diesel Engines in one plant, all mounted on Hussman Spring Mountings. The largest plant yet installed in this manner, in the largest building dependent entirely upon Diesel engines for all its power and light requirements. Thus Hussman Spring Mountings contribute their share to opening up this new market for Diesel engines, by isolating machinery vibrations from the rest of the building, by simplifying and reducing the cost of foundations. Submit your vibration problems to us.

CARL HUSSMAN

Equipment for the Isolation of Vibration and Noise

3001-07 North Oakley Blvd.,
Chicago, Ill.

Indiana Company Plans Standard Steel Dredges

HYDRAULIC, dipper and clam-shell dredges of completely integrated and standardized design have passed the blue-print stage and are to be scheduled for production at the Fort Wayne plant of the American Steel Dredge Company, as soon as present commitments on barges for the Army will permit. This announcement was made by Walter W. Walb, General Manager of the company.

All dredges will have bolted sectional steel hulls and are so designed that all sub-assemblies and equipment can be conveniently transported overland to remote locations, or shipped to foreign countries as hold cargo. The largest single, component unit can be handled by portable crane equipment.

By standardizing the hull sections and carefully planning the distribution of the weight of power plant and operating machinery, it is possible to effect substantial savings in production time and material costs, while in many cases increasing the over-all efficiency of the units.

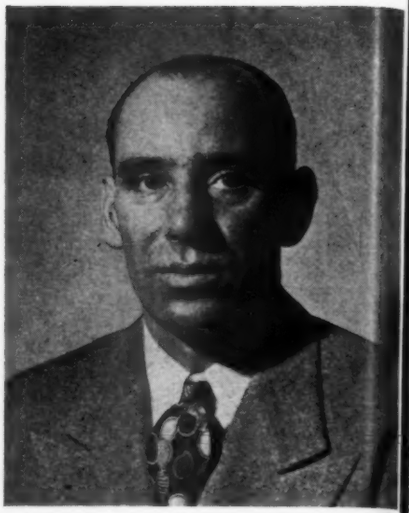
The line of hydraulic dredges will include six, eight, ten, twelve, sixteen and twenty-inch sizes, and will be built for Diesel-electric, electric, steam or Diesel power. The general design of these dredges will be similar to the 12-inch units produced by the company for the Armed Forces.

Enterprise Appointment For New Orleans

C. G. COX, vice president and general manager of the Enterprise Engine and Foundry Co., has announced the appointment of Paul K. Wabnig as Enterprise representative in New Orleans, in charge of sales, service, and parts of the Gulf territory, extending from Florida to Texas.

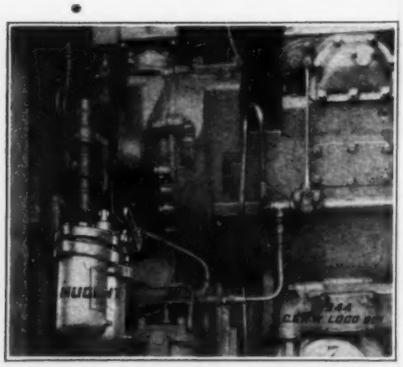
Since joining Enterprise three years ago, Mr. Wabnig has been attached to the company's head offices in San Francisco, from where he has been working on assignments involving Diesel installations and applications in California.

Mr. Wabnig's experience in the Diesel engineering field includes ten years in Alaska and a number of years in the Great Lakes territory, where he was engaged in the planning and development of Diesel applications of various types. The newly established New Orleans offi of Enterprise are located at 902 Poydras Stree where in addition to sales and service quarte there is being maintained a parts depot with large and complete stock of parts for all mode Enterprise Diesel engines to serve Enterpri users in the Gulf area.



Paul K. Wabnig

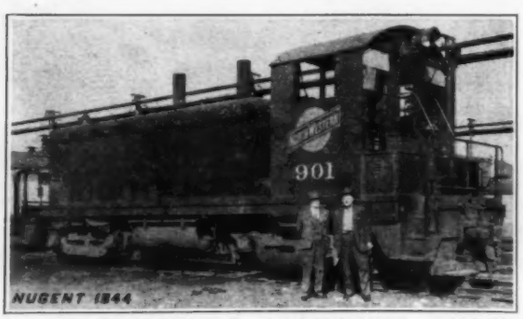
1576 ENGINE HOURS ...on one recharge set



The above view shows the Nugent Duplex Fuel Oil Filters installed in the Diesel locomotive shown at the right. The throw-away type filter recharge used in these filters is easily and quickly inserted in the filter cage, assuring the user of constant, thorough filtering.

NUGENT TRADE MARK

. . . . and perfect filtration. That's the performance record of a NUGENT Duple Fuel Oil Filter installed on the Diesel switching locomotive shown below.



"NO. 901"—a 900 h.p., cycle Diesel switche moving variable loads arou curves and up and dow ramps—recently operated 15 engine hours without repla ing the absorbent filter r charge in its Nugent Duple Fuel Oil Filters. During th time 283,680 gallons of fu oil was filtered and the e gine consumed 8,012 gallon The balance of the oil was b passed back to the storag tank.

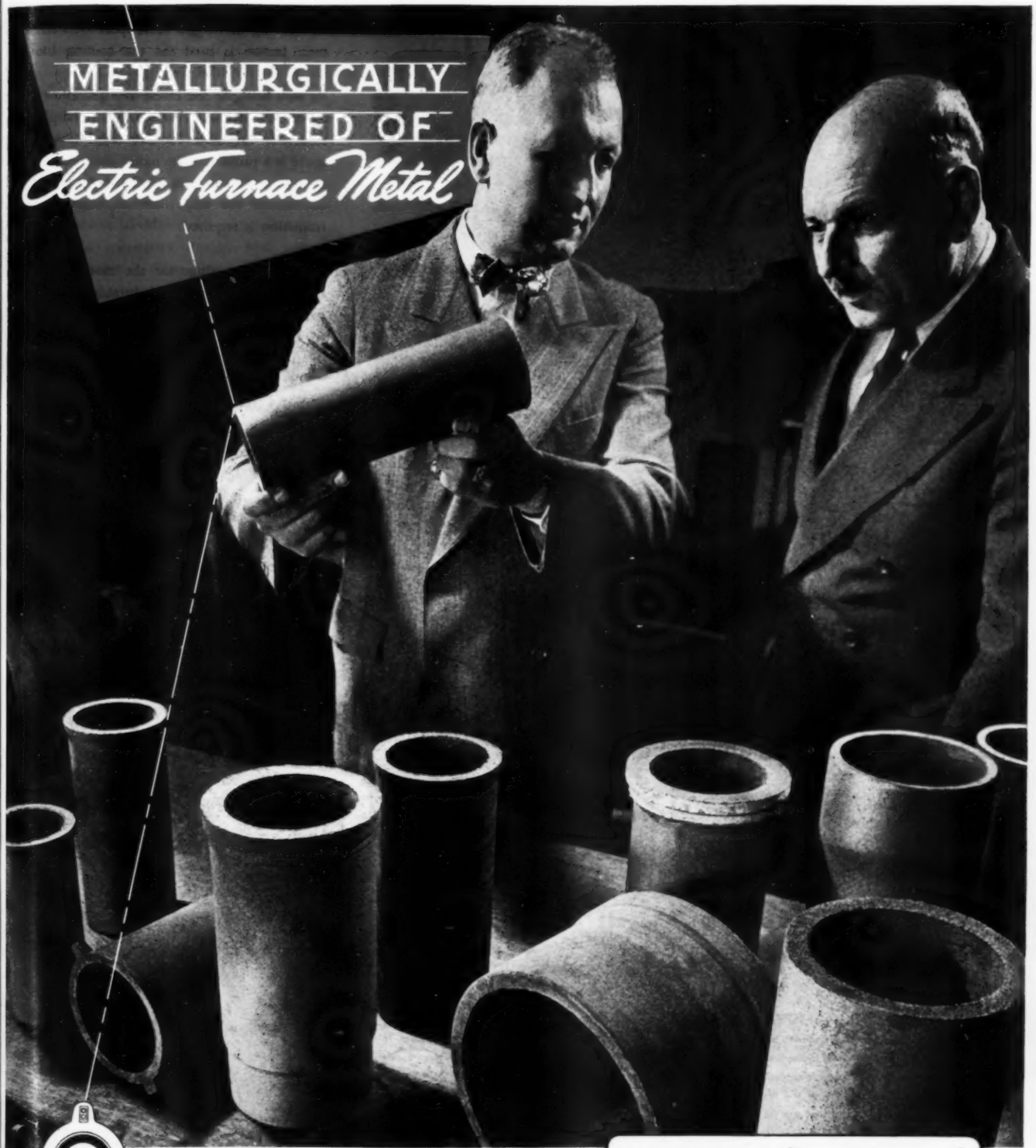
That's the kind of filteri that means maximum Dies engine efficiency and the u timate in oil conservation.

Get full details on the com plete line of Nugent Fuel an Lube Oil Filters . . . wri for Bulletin No. 7A.

WM. W. NUGENT & COMPANY, Inc.
415 N. Hermitage Ave., Chicago 22, Ill.

NUGENT FILTERS

SINCE 1897



and Centrifugally Cast

C. W. C. centrifugal casting of special electric furnace alloyed metal assures cylinder liners that are uniform in density and structure, with high Brinell and excellent machinability. Here is definitely the real solution to engine wear caused by corrosion. Write today for complete information!

CAMPBELL, WYANT & CANNON FOUNDRY CO.
MUSKEGON, MICHIGAN

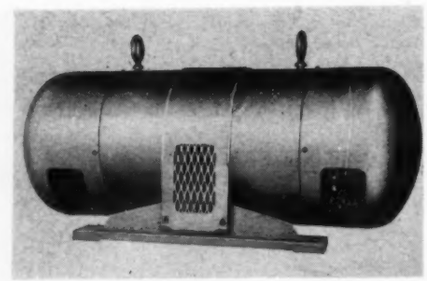
CAMPBELL, WYANT & CANNON FOUNDRIES

- MUSKEGON, MICHIGAN
  - Henry Street Plant
  - Sanford Street Plant
  - C. W. C. Crankshaft Corp.
- SOUTH HAVEN, MICHIGAN
  - National Motor Castings Co.
- LANSING, MICHIGAN
  - Centrifugal Fusing Co.
- BETTENDORF, IOWA
  - Ordnance Steel Foundry Co.

New Compact M-G Set Announced

IN order to accomplish with larger units (up to 15 kw.) the space-saving features that it had introduced for smaller ones, the Kurz and Root Company of Appleton, Wisconsin, has come out with a second compact mounting design for motor-generator sets.

The motor and generator are fastened to twin center frames, and are served by a common shaft. The frames merge into an integral steel base giving sturdy mounting with a considerable saving in weight. The space between the twin frames is used for the cooling blower.



Kurz and Root New Compact M-G Set

By thus bringing the motor and generator close together, a compact installation is accomplished, especially favorable for shipboard use, where space is a problem. The motor-generators range from 1 to 15 kw., and are built either AC-DC or DC-AC for any situation where current transition is required.

Brush support rings for the motor and generator are being made of durable Bakelite, to overcome grounding, which frequently occurs in the conventional mounting used by most manufacturers.

DEMA Holds Annual Meeting

ROBERT E. FRIEND, president of Nordberg Mfg. Co., was re-elected to the presidency of the Diesel Engine Manufacturers Association when that organization held its annual meeting Dec. 6 at Cleveland, Ohio. Two new vice presidents were also elected. They are F. H. Kilberry, who heads Atlas Imperial Diesel Engine Co.; and E. J. Schwanhausser, vice president of Worthington Pump Machinery Corp. Robert H. Morse, Jr., general sales manager of Fairbanks, Morse & Co., was re-elected DEMA's treasurer. Harvey T. Hill continues as executive director. Four new directors of the association were named as follows: Norris H. Schwenk, president of Busch-Sulzer Bros.-Diesel Engine Co.; Charles E. Brinley, chairman of the board, Baldwin Locomotive Works; Charles G. Cox, vice president of Enterprise Engine & Foundry Co., and Mr. Kilberry.

George W. Codrington, a vice president of General Motors Corp., scans report at annual meeting of Diesel Engine Manufacturers Association. Looking on are E. J. Schwanhausser (left), Worthington Pump & Machinery Corp., a newly elected vice president of DEMA; and Robert E. Friend (right), Nordberg Mfg. Co., re-elected to the Association's presidency.

Continuing as directors are George W. Codrington, vice president General Motors Corp.

America's Radial Air-cooled Diesel Engine

Guiberson's present world leadership in the field of radial diesel engineering began more than fifteen years ago when Guiberson engineers developed the high-speed air-cooled radial diesel engine. Twelve years ago the first Guiberson-powered plane took to the air and the first A.T.C. certificate for the Guiberson radial diesel engine was granted.

Nine years ago the first Guiberson radial diesel took its place in the tanks of our first armored force. Today the Guiberson radial diesel engine provides dependable, low-cost, fire-safe power that has helped America win victory—and it is the power plant that will win leadership for America in the field of post-war transportation on land, on sea, and in the air!

Established 1919 Guiberson U.S.A.

THE GUIBERSON CORPORATION
Aircraft and Heater Division

GUIBERSON DIESEL ENGINE CO
DALLAS TEXAS

and general manager Cleveland Diesel Engine division; Gordon Lefebvre, president and general manager Cooper-Bessemer Corp.; and Messrs. Friend, Morse and Schwanhausser. A new activity of the association—that of keeping a watchful eye on proposed legislation that may affect the industry favorably or adversely—was announced by Mr. Hill. He stated also that DEMA expected to issue early in 1945 a booklet describing the Diesel engine and the industry that produces it. Material accomplishments of the traffic committee during 1945 were shown by Chairman Schwanhausser. Roland W. Bayerlein, sales manager of Nordberg's heavy machinery division, reported on wage differentials.

A caprice of nature prevented Mr. Lefebvre, educational committee chairman, from making his report. Flying enroute Grove City, Pa. to Cleveland, he was forced to turn back by menacing weather conditions when 15 miles from destination. Mr. Hill pinch-hit for him, reporting a need for approximately 2,000 Diesel engines on the part of engineering schools, which hope to obtain them from wartime surpluses. Mr. Codrington was luncheon host to the members at Hollenden Hotel, after which he showed them through the plant he supervises.

Detroit Diesel Division To Handle Engineering and Sale of Marine Diesels

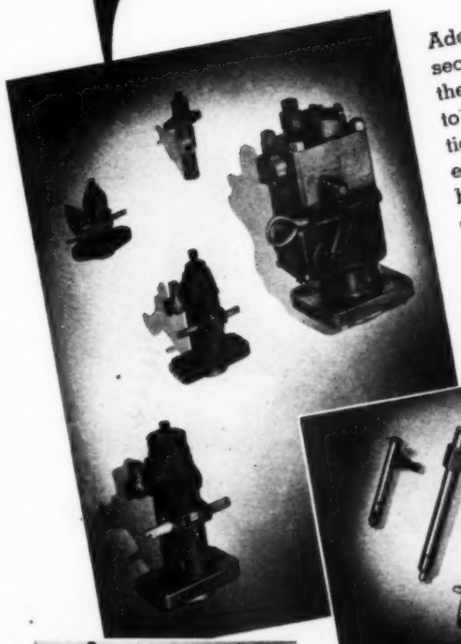
C. E. WILSON, president of General Motors, announces that the Detroit Diesel Engine Division is now set up to meet directly, with its own engineering, distribution and maintenance departments, the need of Diesel engines for essential marine uses.

Since the establishment in 1938 of the Detroit Diesel Engine Division of General Motors Corporation, that portion of the plant's output supplied to the marine field was adapted and merchandised by Gray Marine Motor Company. Because of its long experience and widely established dealer organization, Gray did a most excellent job in introducing this new type engine to the marine field. During the war Gray has made an outstanding contribution by converting many thousands of these engines for use in the U. S. Navy and other services.

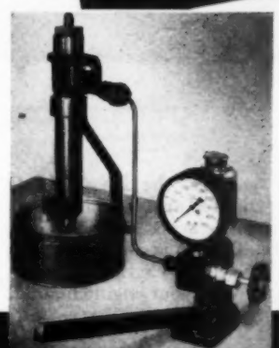
The business relationship between General Motors and Gray Marine Motor Company expired December 31, 1944, and henceforth General Motors will handle distribution of its products in the marine field. Government appreciation of the needs of essential users has resulted

ADECO

SAFEGUARD DIESEL ENGINE PERFORMANCE *with Dependable* ADECO FUEL INJECTION EQUIPMENT



Adeco equipment is engineered to secure the optimum performance of the engine you are building or plan to build. Today's line of fuel injection pumps, nozzles and nozzle holders is the most dependable in Adeco history—the result of years of pioneering and research for the diesel industry. Their performance speaks louder than words in pointing the way to the finest in diesel fuel injection equipment.



ADECO NOZZLE TESTER for LOW-COST MAINTENANCE

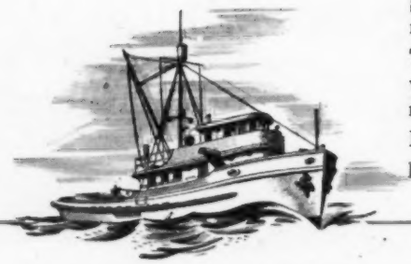
America s most widely used Nozzle Tester enables any mechanic to make quick, accurate tests on injector opening pressure, spray pattern, etc., and detect stuck needle valves and leakage around valve seats. Compact, portable, sturdy, precision-built. Pressures up to 10,000 p.s.i. Tests both large and small injectors. Avoids costly delays and possible damage to engine. Also obtainable with Navy-approved gauge. Write for bulletin.

Ideal for Testing Hydraulic Equipment

AIRCRAFT & DIESEL EQUIPMENT CORPORATION

4401 RAVENSWOOD AVENUE, CHICAGO 40, ILLINOIS

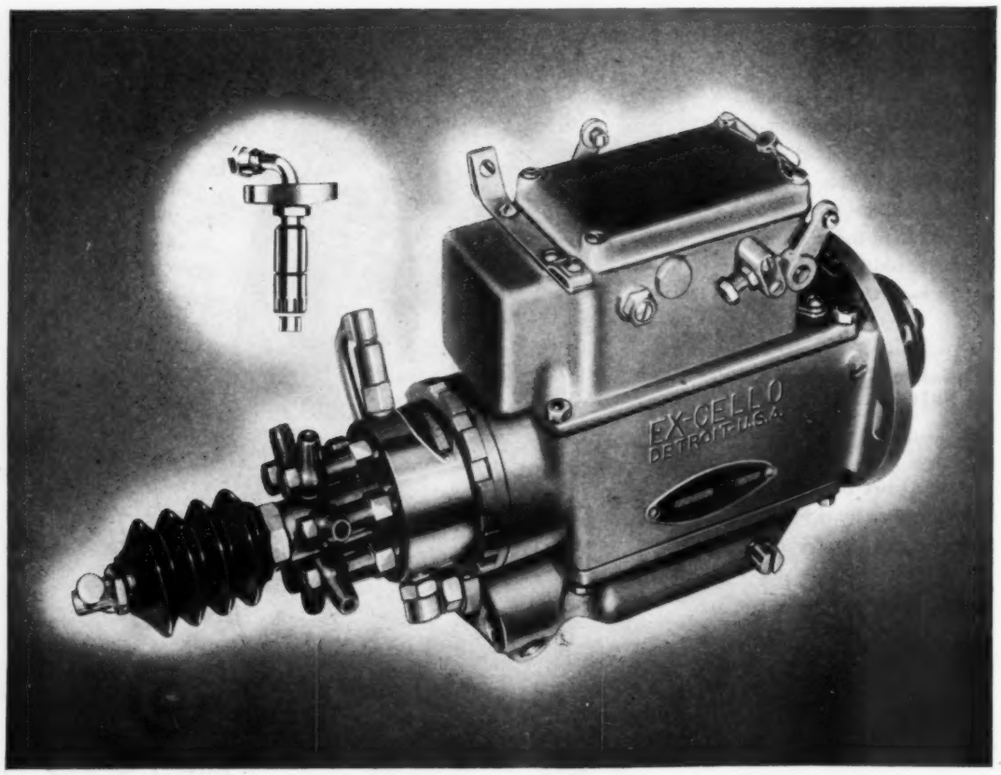
For Variable Speed Applications



By AUTOMATICALLY advancing fuel injection timing in relation to engine speed, the EX-CELL-O Type KB Fuel Injection Pump gives your Diesel Engines maximum power output at all speeds with minimum fuel consumption.

This EX-CELL-O feature of "speed responsive timing control" provides smooth flexible operation throughout the operating range and materially increases the service life of vital engine parts.

If you have high speed engines that require automatic timing, it will pay you to investigate this job proven EX-CELL-O pump today.



INCORPORATING exclusive patented features, the EX-CELL-O Nozzle (illustrated in circle) is dependable and trouble free in performance. It is of the outwardly opening, pintle type. These working parts are contained in a nozzle tip assembly. The tip is assembled in a holder designed for mounting in the engine. These EX-CELL-O Nozzles are interchangeable with other type nozzles through your engine builder.

Fuel Injection Division

EX-CELL-O CORPORATION ★ ★ DETROIT 6, MICHIGAN

EX-CELL-O

EX-CELL-O *for* PRECISION

It takes DEPTH *to Actually* cleanse Oil!

ESPECIALLY HEAVY DUTY DETERGENT OILS

Measure the length of the oil travel through a DeLuxe cartridge and you'll have one of the important reasons why DeLuxe does more than strain or filter oil . . . why DeLuxe actually cleanses oil of the microscopic asphaltenes *before they can combine* to form sludge and other contaminants!

In the DeLuxe cartridge the oil travels from bottom to top *throughout the entire depth* of the cartridge. Thus the oil comes in contact with *sufficient* cartridge material to become thoroughly cleansed. Important to the cleansing of any oil, this depth factor is doubly important with detergent type oils where the contaminating asphaltenes are highly diffused.

Adequate depth plus *controlled flow*, the collapse preventing *cartridge spring*, the *cone* which distributes the oil uniformly at the cartridge base and the *catch basin sump* . . . you get them all *only* in the De Luxe filter and cartridge.

GENUINE DELUXE CARTRIDGES ARE AVAILABLE . . . *Accept No Substitutes.*

DELUXE *Oil Filter*

DOES MORE THAN STRAIN OIL . . . MORE THAN FILTER OIL
ACTUALLY CLEANSES OIL

DELUXE PRODUCTS CORP., 1416 Lake Street, LaPorte, Indiana

in increasing allocations being made to such users with requisite priorities.

New marine applications of Diesels, as well as replacements with modern Diesel engines, call for complete engineering, installation and maintenance service to marine architects, ship builders and operators. Detroit Diesel Division is organized to provide this service.

During the war, use of the light weight two cycle engine in marine applications has been greatly expanded and General Motors developed the practice of using groups of engines to furnish high horsepower. An example of this practice is found in the now famous LCI (Landing Craft Infantry) in which two groups of four engines each are used to supply a total of 1800 horsepower. Another war development by General Motors is the variable pitch marine propeller, of which large numbers have been used by the U. S. Navy.

KEEP THOSE DIESELS IN SERVICE

Smart Diesel men practice *protective maintenance* to insure long-life and economical operation of transportation and stationary engines — never relax their fight against sludge, gum, acid and corrosion.

Simplicity itself—LOOSITE safely and economically rids the entire lubrication system of dangerous petroleum residues. Then SILOO DIESEL, added to fresh crankcase oil, functions *continuously* — preventing further accumulations. Engines operate at maximum efficiency, oil reaches every vital part—thus costly layups and repairs are avoided . . . engine life prolonged.

SILOO SPECIAL FOR DIESEL INJECTORS eliminates and prevents clogging of injectors and SILOO FUEL OIL TANK SOLVENT is a positive acting treatment for cleaning fuel oil tanks and removing condensation and polymerized gums. Full information on *all* SILOO products — engineered to your needs — will be sent you on request.

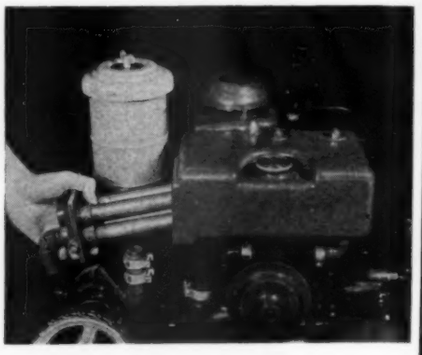
PETROLEUM SOLVENTS CORPORATION

Solvents For *All* Types of Petroleum Residues

General Offices: 331 Madison Ave., New York 17, N. Y.

New Type Heat Exchanger

THE use of a new type heat exchanger, containing an integral expansion tank, eliminates a maze of external piping and tubing formerly considered a necessary part of a Diesel installation. The heat exchanger—manufactured by R. H. Sheppard Company, is so constructed that any foreign material large enough to pass through the sea water pump will also pass through the exchanger. Cooling unit tubing used is about ¾ in.—the same size as the openings in the pump and suction lines.



A by-pass thermostat built into the unit requires no adjustment in any climate. When the engine is first started, the fresh water bypasses the cooling unit and returns directly to the block until the engine reaches the proper operating temperature. Once this temperature is attained, the by-pass line closes automatically and the full flow is directed over the cooling unit. The cooling system is equipped with a positive displacement, rubber impeller pump. This system is provided with two connections —one to and one from the sea. A zinc anti-corrosion plug in the salt water line prevents corrosion of the coils due to electrolysis.

The construction of the heat exchanger is so simple that inspection or repair is easily performed by any average mechanic. To remove the cooling unit intact, it is necessary only to remove four bolts and the hose clamp.

Fraser Praises Army Engineers, Railroaders for Restoring Rail Lines to Front

"ARMY engineers and railroaders in France have done a magnificent job in restoring rail transport to the front," Duncan W. Fraser, president of the American Locomotive Company, said on his return to the United States following an inspection tour of military installations in continental Europe and England early in December.

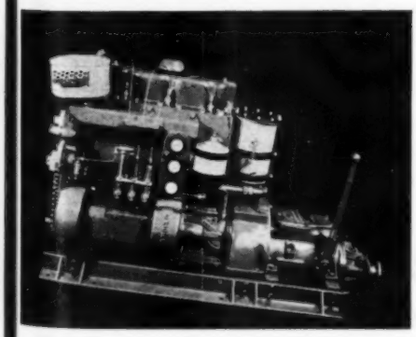
"Hundreds of U. S.-built locomotives are now hauling thousands of tons of supplies daily from ports to supply areas, replacing the emergency Red Ball express truck highway. Some 45% of the locomotives and 40% of the cars in France had been destroyed by bombing," he said.

Left to right: Duncan W. Fraser, President, American Locomotive Co., and Charles Kendrick, president, Schlage Lock Co., stand in front of Aachen Munster Cathedral, Germany.

Mr. Fraser met and talked with top-rank U. S. Generals including Generals Eisenhower, Bradley, Patton and Hodges, who described their problems and needs frankly and in detail.

On the basis of his talks and what he saw Mr. Fraser warned against over-optimism. "The war in Europe is not won. The need for munitions is urgent. It demands continued all-out effort on the part of all of us who have anything to do with war production."

Sheppard Announces New Small Boat Diesel



Sheppard 3-cylinder, 28 hp. Marine Diesel.

THE R. H. Sheppard Company has announced its Model 6C Diesel which is a full marine adaptation of its Model 6 Stationary engine. The new marine model is complete with all

Buckeye Marine Diesels equipped with

Alnor

Exhaust Pyrometers

The Buckeye Machine Company, engine builders since 1908, use Alnor Exhaust Pyrometers for dependable temperature indication, in company with the majority of Diesel engine manufacturers. Checking exhaust temperatures with the Alnor Pyrometer is a dependable guide to uniform loading, efficient operation, and accurate adjustment and maintenance.

There is an Alnor Exhaust Pyrometer to meet the needs of any type of engine, large or small. Write for bulletin with complete data.

ILLINOIS TESTING LABORATORIES, INC.
420 North La Salle Street
Chicago 10, Illinois

operating accessories built-in or attached including variable speed governor, lever type throttle control, built-in Sheppard heat exchanger, gage panel, electric generator and starter, filters and water-cooled manifold. The unit is rated 28 hp. at 1400 rpm. and is applied with Joe's reverse and reduction gear. Full particulars will be mailed on request to R. H. Sheppard Company, Hanover, Pa.

Air Compressors—Feller

A MOST complete work on Air Compressors by Eugene W. F. Feller has just been published. Embracing 460 pages in text form this new book is profusely illustrated as to various types of air compressors, their uses, and construction. Numerous accessories and compressor drive arrangements are also illustrated and described.

The text is written primarily for the mechanical engineering student and the operating engineer and covers, in addition to the whole list of compressor types, the installation, operation and maintenance of compressors as well as the theory and thermodynamics of compressed air. McGraw-Hill, $4.50.

The big jobs call for Diesels. They've got the power and dependability that tough work calls for. Matching the dependability of Diesel performance is the dependability of electric starting with Globe Spinning Power Batteries. Their patented Perma-Set plates assure long, uniform service . . . fast starting on any job, at any temperature.

You'll find it profitable to talk with a Globe engineer. Address nearest factory.

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DP-245

New Diesel Self-Propelled Earthmover Combines Speed With Safety

DESIGNED for high speed earthmoving operations, the new Wooldridge Terra-Cobra, self-propelled Earthmover embodies many new features which insure fast and efficient performance coupled with maximum safety of operation. Positive two-wheel hydraulic steering gives the operator full control of the unit at all times by maintaining a fixed direction of travel over all types of grounds and at all speeds. No steering clutches nor individual front wheel brakes are employed. Both drive wheels turn at exactly the same time under full traction and power by means of a single steering bar. As one wheel never "idles" while the other turns there is never any chance of "jacknifing." Thus accidents are avoided and costly damage to equipment is materially reduced.

The New Wooldridge Diesel Earthmover

Powered by a heavy duty Diesel engine with four speeds forward, plus a reverse gear, the Terra-Cobra attains travel speeds up to 20 mph. on either short or long stretches. Surplus rim-pull, not only permits rapid acceleration to any desired speed in a short distance but it likewise provides sufficient power for the fully loaded unit to climb comparatively steep slopes without the help of a "pusher."

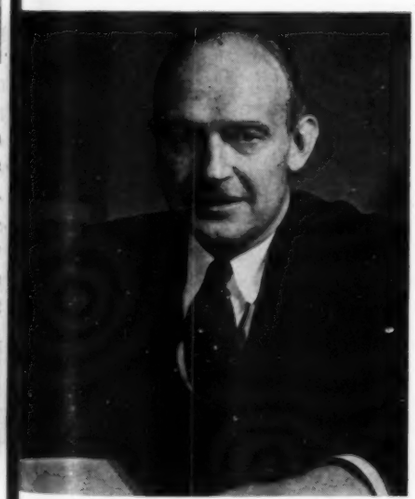
A completely illustrated bulletin No. TA-425 describing the new Terra-Cobra is available on request to Wooldridge Manufacturing Company, Sunnyvale, California.

Clark Bros. Joins Dresser Members In New York Office

CLARK Bros. Company has opened new offices with other members of Dresser Industries in the Chanin Bldg. with T. F. Hudgins as Export Manager. R. R. McCartney, who has been handling our Clark account in conjunction with Val. R. Wittich for the past five years, will be the New York District Manager.

T. F. Hudgins

Mr. Hudgins comes to Clark Bros. Company with a wide background in the oil field and heavy machinery business, having graduated from the University of Kentucky in 1909. He was then instructor in engineering at Kentucky and Purdue. Mr. Hudgins served in World War I and returned with the rank of Major. From 1919 to 1922 he was with the National Supply Company in the United States and in London. From 1922 to 1944 he has been with the Cooper-Bessemer Corporation.

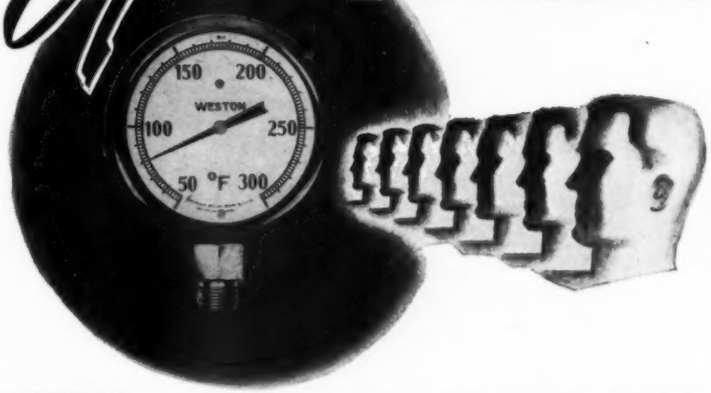


R. R. McCartney

Mr. McCartney is a graduate of Pratt Institute and previous to his joining Clark Bros. in 1938 was with the Worthington Pump and Machinery Company and Gulf Oil in various engineering and sales capacities.

Clark Bros. Co., Inc., announces with regret the resignation of Val R. Wittich, Jr., their Export and New York representative, effective December 1, 1944. Mr. Wittich has represented

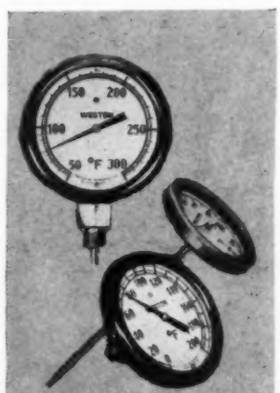
Eyes RIGHT!



WESTON'S ALL-METAL TEMPERATURE PRINCIPLE ASSURES DEPENDABLE READINGS, *OVER LONGER PERIODS!*

The *long-term* dependability of the WESTON thermometer stems from its rugged, all-metal construction. It consists of only a simple, durable all-metal temperature element safely encased in a stainless steel stem. No gases or liquids, no capillary, no complicated mechanical linkages, no fragile parts are employed. Because of this extreme simplicity, and the absence of so many common trouble points, WESTONS maintain their high initial accuracy *over far longer* periods. Thus they provide better protection for processes and equipment, and keep replacement and maintenance costs at a far lower level.

Literature describing these dependable and rugged thermometers, including types, stem lengths, prices, etc., gladly sent on request. Weston Electrical Instrument Corporation, 579 Frelinghuysen Avenue, Newark 5, New Jersey.



WESTON All-Metal Temperature Gauges are available in sizes and types for most industrial needs . . . as well as in laboratory models with full scale accuracy within ½ of 1%.

WESTON All-Metal TEMPERATURE GAUGES

$5.00

295 ENGINES *described . . . profusely illustrated*

Alco Diesels for Universal Application
Alco Stationary Diesels
Alco Sulzer Diesels
Anderson Model KD
Atlas Imperial Diesels
Atlas Lanova Diesels
Baldwin Diesels
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Busch-Sulzer Bros. Diesels
Caterpillar Automotive Diesels
Caterpillar Industrial Diesels
Caterpillar Marine Diesels
Chicago Pneumatic Diesels
Chrysler Diesels
Clark Bros. Diesels
Climax Models D 148 and D 297
Cooper-Bessemer Diesels
Cummins Diesels
Cummins Fuel Injection System
Dodge Lanova Diesel
Enterprise Standard & Supercharged Diesels
Fairbanks-Morse Diesels
Fulton Iron Works Co., Models RR, DES and KS
General Motors Diesels
Gray Marine Diesels
Guiberson Radial Diesels
Hamilton Diesels
Joshua Hendy Series 50 Diesels
Hercules Automotive Diesels
Hill Model R. Diesels
Ingersoll-Rand Type "S"
International Tractor and Industrial Types
Kahlenberg Marine and Stationary Diesels
Kermath 4-cycle Marine Conversions
Lathrop Types D-50 and D-75
Lister-Blackstone Models CD and CE
Lorimer Slow Speed Heavy Duty Diesels
Mack-Lanova Trucks, Bus and Marine
Murphy Diesels
Nordberg Convertible Diesel-Gas Engines
Nordberg 2-cycle Diesels
Palmer Bros. Type RND
Rathbun-Jones Diesel and Gas Engines
John Reiner Diesel Marine Auxiliary Units
Sheppard Models 6 and 7
Superior (National Supply Co.) Diesels
Union Marine and Stationary Diesels
United States Motors Diesel-Electric Plants
Vesa-Severin Diesels
Waukesha Industrial and Marine Diesels
Waukesha Hesselman Industrial Type
Waukesha Multi-fuel Oil Engines
Witte Diesels and Diesel Electric Plants
Wolverine 2- and 4-cycle Diesels
Worthington Diesels

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Adaco Fuel Injection Equipment
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Ex-Cell-O Fuel Injection Equipment
American Blower Hydraulic Coupling
Durable Pump Valve Service
Diamond Chain Drives
Roots Connersville Supercharging Blower (R-W, formerly McCulloch, Roots-Type Supercharger
Elliott (Buchi System) Turbochargers
Elliott Electromagnetic Slip Coupling

VOLUME 9

The Ninth Edition of the DIESEL ENGINE CATALOG, edited by Rex W. Wadman, is now available. This is not a reprint of previous volumes — the book has been completely revised and now contains descriptions and detailed specifications of over Two-Hundred and Ninety-five engines — profusely illustrated. Color is freely used to trace fuel, lube, and cooling systems. Nothing like it published. A large section is devoted to equipment associated with Diesel installation and operation and there is a directory of Diesel Engine and Accessory manufacturers. The most useful Diesel book available — widely used by those who specify and buy Diesels and accessories and by engineers in all fields of power application. An indispensable book for all who want to know Diesel engines and their applications.

ORDER YOUR COPY *NOW*

DIESEL ENGINES, INC. — Two West Forty-Fifth Street — New York 19, N. Y.

Enter my order today for a copy of the New Diesel Engine Catalog, Volume Nine, Edited by Rex W. Wadman, for which I enclose $5.00.

NAME .....

ADDRESS .....

PLEASE PRINT NAME AND ADDRESS

Clark Bros. in the export and New York territories since 1929. The consolidation in New York City of the Dresser Industries created an overlapping of interests which prompted Mr. Wittich to terminate his long and mutually satisfactory relations with Clark Bros. Company.

Mr. Wittich will continue to represent in his present location, 30 Rockefeller Plaza, S. R. Bowen Company, Texas Iron Works and Portable Rig, Oil Center Tool Company, Emsco Screen Pipe Company, Miller Sand Pump Company and Wagner-Morehouse, Inc.

Clark Bros. Company's new offices are located in the Chanin Building, 122 East 42nd Street, New York.

Franke Appointed Advertising Director

THE appointment of Gene Franke as Director of Advertising and Public Relations has been announced by John B. Walker, Vice-President in Charge of Sales, Aireon Manufacturing Corporation, (formerly Aircraft Accessories Corporation). Gene Franke joins the corporation after two years as Principal Administrative Analyst, Army Service Forces.

Gene Franke

Prior to the start of the war, Gene Franke spent 9 years in sales, sales administration and advertising for a number of leading manufacturers including Underwood Elliott Fisher, Remington-Rand and Victor Adding Machine Co. His headquarters, for the present, will be at the corporation's Kansas City, Kansas plant. He will, however, direct the advertising and public relation activities for all units, including the Burbank, California, plants which are engaged in the manufacture of engineered power controls.

ABOVE INSTALLATION
Capacity 16,000 c.f.m.,
900 r.p.m., 239 b.h.p.

The definite economies and power increases brought about by the addition of Roots - Connersville Positive Displacement Blowers for supercharging and scavenging Diesels is an established fact. The resulting superior performance casts a shadow of obsolesence over those Diesels not so equipped. As the originators of the Roots type blower, our many years of sound experience have developed and perfected it to its present high degree of efficiency and dependability. It will pay you to consult with us regarding your supercharging and scavenging problems.

ROOTS-CONNERSVILLE BLOWER CORP.
One of the Dresser Industries
502 Midland Ave. Connersville, Indiana

Roots CONNERSVILLE SINCE 1854
Supercharging and Scavenging BLOWERS

FACTS about ROTARY PUMPS

This bulletin tells you why and how
BLACKMER ROTARIES
are *SELF-ADJUSTING FOR WEAR*
Write Now For
BULLETIN NO. 306—
FACTS ABOUT ROTARY PUMPS
Bulletin No. 302—Pump Engineering Data

BLACKMER PUMP COMPANY
1960 Century Ave., Grand Rapids 9, Michigan
Dependable Pumps for Diesels

POWER PUMPS - HAND PUMPS
- EZY-KLEEN STRAINERS -

8 years service on a Diesel engine

WALDRON COUPLING

Gear Type — Forged Steel

On a single cylinder diesel to an ammonia compressor, a WALDRON COUPLING has operated almost continuously over a period of eight years with practically no signs of wear. This remarkable performance has been achieved despite the fact that the engine crank shaft was slightly sprung at the time the coupling was installed — a condition worse than misalignment. Such records for long continuous, trouble free service are not too uncommon with users of WALDRON GEAR COUPLINGS on diesel drives.

Write for our Catalog 56 which describes design refinements, construction details, rating tables, etc. No obligation.

JOHN WALDRON CORPORATION

Main Office & Works — **NEW BRUNSWICK, N. J.**

SALES REPRESENTATIVES IN PRINCIPAL CITIES

With these features:

- Cool operation
- Low upkeep cost—minimum servicing
- Ample overload capacity
- Compact—reducing space requirements
- Oversize ball bearings
- Highest grade insulation
- Simplicity of construction
- Minimum vibration and noise
- Long years of dependable operation

D.C. MOTORS

Sizes 1 to 25 H.P.

Kurz & Root direct current motors are available in wide range of electrical and mechanical characteristics—regularly built in sizes 1 to 25 H.P. in standard speed range, with shunt, series or compound windings as required. Our constant speed D.C. motors are used for a wide range of machinery and general purposes. Can be designed for speed adjustment in small steps over wide ranges. Complete data upon request.

AC-DC GENERATORS

KURZ and ROOT Company *Since 1898*

APPLETON · WISCONSIN

.....and DC motors and motor generator sets

An Important British Development in Internal Combustion Engine Research

PRIOR to the war more than two out of every three petrol, oil or gas engines made in Great Britain, other than those for road vehicle or aircraft use, were exported. The war effort of our engine builders can, as yet, be assessed only by a very few, but it has been of tremendous proportions. It is apparent that this industry has been of great commercial value; it can be of much enhanced national importance provided we can offer to the world the right articles at truly economic prices.

The key to that possibility is research, conducted in an organized way, properly coordinated with associated efforts, and on a basis covering the whole industry. It was to meet just this need that the non-profit-making British Internal Combustion Engine Research Association (B.I.C.E.R.A.) came into being in 194[illegible]. The Association is in receipt of a Government grant from the Department of Scientific and Industrial Research. This supplements the income from member concerns, and is approximately proportional thereto.

Almost every manufacturer is a member of the Association; its sphere covers stationary and portable internal-combustion engines of all sizes, marine engines up to 1,500 hp., and power units for railway traction purposes. They operate on any liquid or gaseous fuels, or combinations of the two.

The three principal aims in engine research on the "whole industry" basis are the attainment of maximum reliability, higher functional efficiency, and lower all-in costs.

A great step forward has just been taken by the Association in obtaining laboratory and allied premises, equipment and a number of skilled personnel, ready for immediate service, and with room for expansion. The group of buildings is at Buckingham Avenue, Slough, and has been used for engine development work for seven years by a private concern. Not only is direct research already in actual progress there but liaison with other bodies, both national and private, increases the volume and value of this work.

The subjects for research are all of general value to this large section of the I.C. engine industry, and makers' own research development work carries on as before, but with the backing of the Association's information service and complementary activities.

Thus the nation's present needs for huge numbers of I.C. engines in a multitude of forms—for landing craft, other special vessels, mobile power stations, and tanks, to mention but a few war uses, has encouraged co-ordinated research on a much broader basis than heretofore. This principle is now in active operation under I.C.E.R.A. for the benefit—in peace as well as in war—of an industry which forms a most important section of British mechanical engineering.

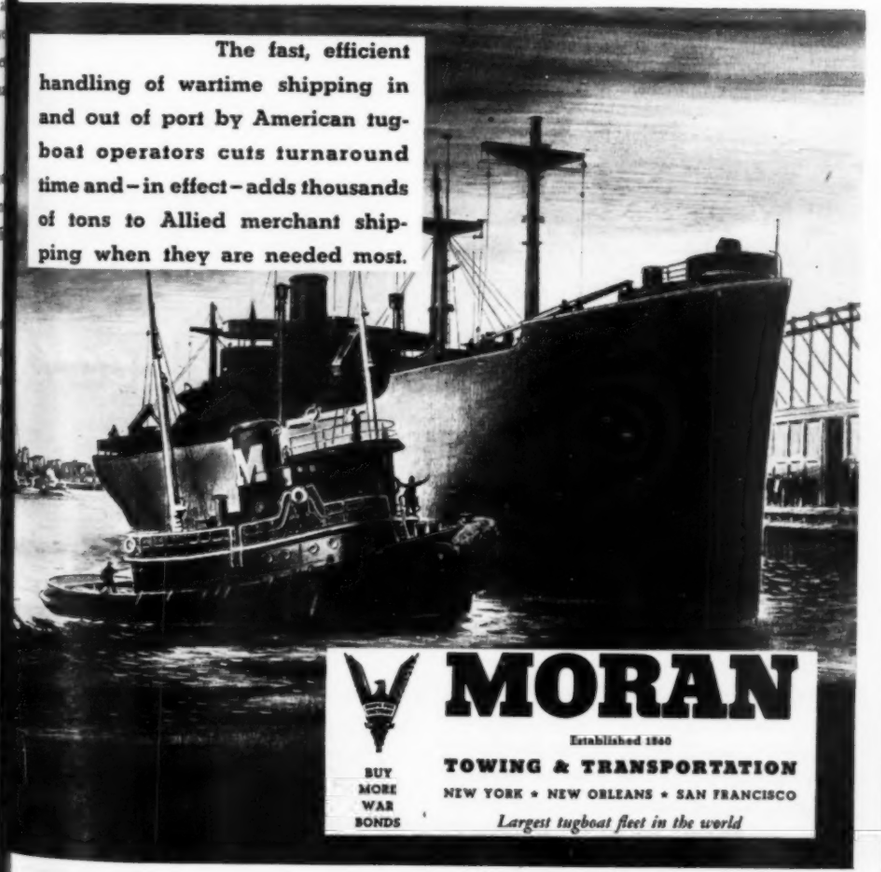
New High-Speed Diesel Electric Road Locomotive Announced

THE newest addition to the growing family of Diesel-electric road locomotives, embracing design knowledge gained partly from war-time operations, is the product of the collaborating firms of Baldwin Locomotive Works and Westinghouse Electric & Mfg. Co. which made its maiden run over the Baltimore & Ohio Railroad between Baltimore and Washington on January 16. Riding in the cab on the initial run of this new 2,000 hp. Diesel locomotive was Charles E. Brinley, Chairman of the Board of Baldwin Locomotive Works. Special arrangements were made with the Baltimore & Ohio Railroad to use its facilities for these test runs.

The two, 1000 hp., 8 cylinder, Diesel engines and electrical facilities are similar to those in Baldwin-Westinghouse switching and transfer locomotives now serving on 60 railroads. The engines are mounted fore and aft. The underframe, trusses and sides are welded to form the equivalent of a single piece of rigid steel, a new technique providing greater resistance to impact and a minimum of vibration. This new locomotive employs a thermostatically controlled cooling system for the engines and various other interesting design features to be described more fully at a later date. The unit is making two round trips daily and is serving on both high-speed freight and passenger service as conditions demand.

A twin to this first unit is now nearing completion in the Baldwin Locomotive shops and, when available, can be coupled together with the initial unit to form a 4,000 hp. road locomotive.

The fast, efficient handling of wartime shipping in and out of port by American tugboat operators cuts turnaround time and—in effect—adds thousands of tons to Allied merchant shipping when they are needed most.



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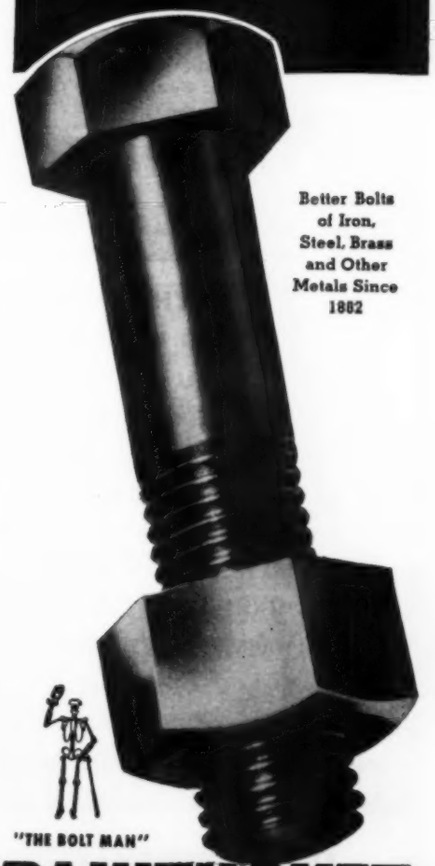

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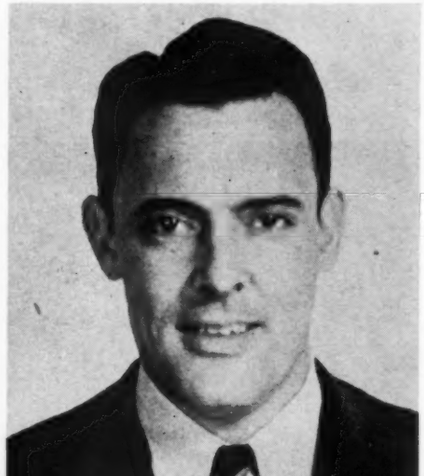
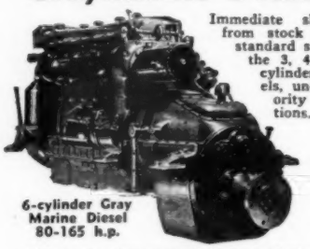
WHEN the new Maritime Commission program was initiated, Enterprise Diesel auxiliaries were specified by the Pennsylvania Shipyard for all of the forty-six C1-A type of motor vessels constructed in their yards at Beaumont, Texas. As the program of C1-M-AV1 Diesel ships developed, identical units were planned for the main auxiliary service on those vessels of that type built by Kaiser Shipyard No. 4, Richmond, Calif.; Pennsylvania Shipyard, Beaumont, Texas; Walter Butler Shipbuilders, Inc., Superior, Wis.; Leatham D. Smith Shipbuilding Co., Sturgeon Bay, Wis.; and Consolidated Steel Corp., Wilmington, Calif., embracing about one-third of the 200 ships of this design completed and now being constructed under this program. In a few instances, similar Enterprise Diesel auxiliary units were also specified for the refrigeration equipment on vessels of this latter classification. Enterprise Diesels produced for this service total 150,000 hp.



Charles G. Cox, Vice President, Enterprise Engine and Foundry Company.

The Enterprise auxiliary power plants, equipped with Westinghouse and General Electric generators, consist, in all of these installations, of two Enterprise 250 kw. capacity, six-cylinder Diesel engines, with 12-inch bore by 15-inch stroke, rated 450 hp. at 450 rpm. Each engine is complete with its generator, single bearing type, mounted on a common steel sub-base. The engine drives all of its own auxiliaries, including sea water pumps, fresh water pumps, lubricating oil pumps, and fuel transfer pumps. Engines are arranged to operate independently or in parallel with close speed regulation con-

Graymarine Diesels



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6-cylinder Gray Marine Diesel 80-165 h.p.

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Layout-Engineers, Designers, Design Draftsmen. Preferably with design experience on gas or Diesel engines, air compressors, etc. For actual drawing board work on layout and development of design on long range research project for U. S. Navy. The Baldwin Locomotive Works, Eddystone, Pa. Statement of availability from WMC required.

trolled by Woodward type S1 hydraulic governors.

The C1-As are ocean-going cargo-ships, equipped with two Nordberg 2000-hp. Diesels for main propulsion power. The hull dimensions are 414 feet by 60 feet by 23.6 feet, with a deadweight of 7416 tons.

Generally designated as coastal cargo ships, the C1-M-AV1 design motorships are 338 feet 6½ inches long and have a deadweight of 3840 tons. An interesting aspect pertaining to these latter type vessels is the fact that they are not intended merely for the war urgency but are so designed that they can form a part of our permanent Merchant Marine in the post-war era.

Sealed Power Appoints District Manager

THE appointment of R. E. Murbarger as Assistant Sales Manager and three changes in district managerships have been announced by John E. Norwood, Sales Manager, Replacement Sales Division of the Sealed Power Corporation.

Mr. Murbarger joined the Sealed Power Corporation in 1937 and for the past five years has been a district manager with headquarters in Syracuse, New York. He has been associated with the replacement parts business for over ten years.

Wm. Pasma, a special representative since 1941 and with Sealed Power since 1937, has been appointed to succeed Mr. Murbarger as district manager. Prior to his advancement three years ago, he was a zone salesman covering Indiana and Kentucky.

The two other district manager assignments announced by Mr. Norwood are J. W. McGavock who will have headquarters in Dallas, Texas, and Wm. E. Haase who will cover New England out of New York.

Gauge Company Moves Its Chicago Office

U. S. GAUGE Company, Sellersville, Pa., announces the relocation of its Chicago office to the Monadnock Block, 53 Jackson Boulevard, Chicago 4, Illinois.

The Chicago office will be under the direction of Walter H. Magee, District Sales Manager who brings to his post a wide experience gained in his former association in the gauge industry as well as Chief of Pressure Instruments, War Production Board, Washington, D. C.

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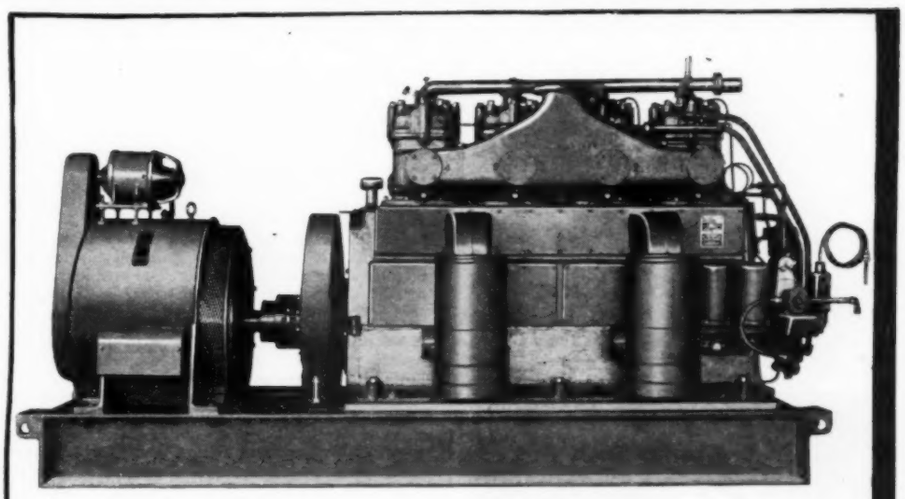

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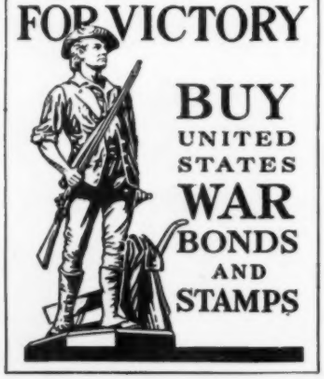

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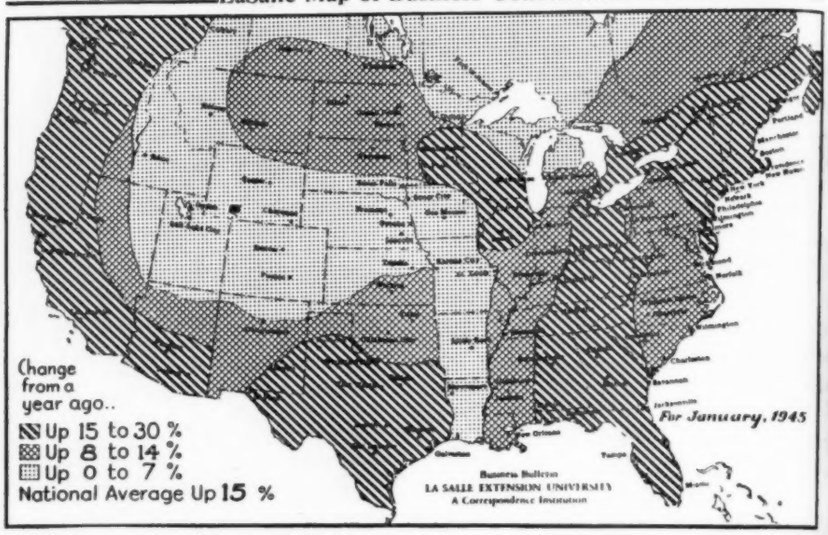
LaSalle Map of Business Conditions


Change from a year ago..
Up 15 to 30 %
Up 8 to 14 %
Up 0 to 7 %
National Average Up 15 %
For January, 1945
Business Bulletin
LA SALLE EXTENSION UNIVERSITY
A Correspondence Institution

For the Sixth Time the New Year Begins With Business at Higher Levels

Map Supplied by BUSINESS BULLETIN DIVISION of La Salle

At the start of the new year, the volume of business is 15 per cent higher than even the high rate which prevailed at the beginning of 1944. The general level is over two and one half times higher than it was in the prewar years and the indications now are for a continuation of the present level for some time. The signs of slackening which appeared at times during the last few months have disappeared and current trend in business volume is again gradually upward.

For the sixth consecutive year, the combined volume of production and trade as measured by financial transactions has exceeded that of the preceding twelve months, although the increase this year has been the smallest of the entire period. This extended expansion of business has extended far longer than usual, even more than the five years of rising business activity after the low point of 1932 and also longer than the sustained period of prosperity in the 1920's. The usual pattern of business fluctuations is two years of expansion and one year of contraction. War expenditures, of course, account for the difference from normal changes during recent years.

All parts of the country are sharing in the improved conditions and in every major section both business and agriculture are better than they were a year ago. In some communities, the trend has been downward in line with the gradual reduction in some factories but it has not extended far enough to affect the general situation to any great extent. Many shifts are constantly taking place, as is nearly always the case, but declines in most fields are offset by increases in others.

The Map shows that the greatest gains have again been made in the major industrial regions, although some agricultural sections have not been far behind. The most recent trends have boosted business along the Pacific Coast and in the New England states. Business in the industrial area around the Great Lakes is also holding up better than the national average.

The increase along the Atlantic Coast, both in the north and in the south, has been due to the large new orders for war materials and equipment. Shipments abroad for the armed forces as well as for lend-lease have been a predominant factor in all the seacoast cities. Spending is still large in connection with the military camps throughout the South and it has helped stimulate trade in that part of the country.

Around the Great Lakes, war-production in large numbers of factories is keeping business activity high in nearly every community. Cities in which steel mills are located have gained somewhat less than have those in which the manufacture of finished products and equipment is predominant. Steel operations have changed little during the last year.

Agricultural conditions in the Middle West are favorable but business in that section of the country has not increased quite so much as it has in other regions. In the Southern states, especially Texas and the Southwest, business has been slightly better than in the North. Good crops and large output of petroleum account for these differences.

Activity in the mountain states has been lagging slightly but it is still better than a year ago. Mining operations have been speeded up in order to furnish the metals that are needed to produce military supplies. The Pacific Coast states are again taking the lead and business activity has recently been speeding up even faster than the national average.

Business in Canada is following the same trend as in the United States but for several months the increases have been slightly greater. The areas of greatest expansion are the western provinces and the industrial region north of the Great Lakes. The gains have been almost as much in the agricultural regions. Large consumer demand and continued spending for war will keep the volume of trade and industry at a high level.

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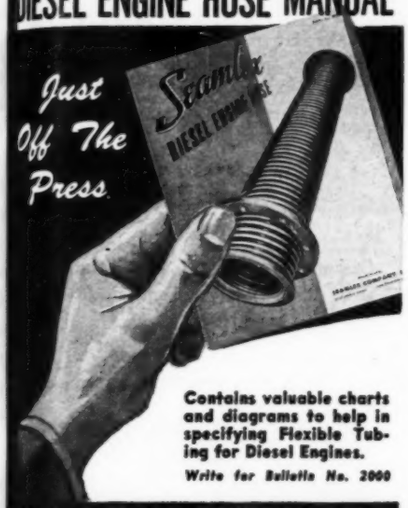
DIESEL ENGINE HOSE MANUAL



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West Coast Diesel News

By JIM MEDFORD

WITH capacity of 350 tons in ten fish wells, the 138-ft. *Espirito Santo* for Van Camp Sea Food, San Pedro, is building by Soule Steel Co., San Francisco, California; is steel with 560 hp. Union Diesel and a pair Caterpillar 75 kw. Diesel generator sets; Fairbanks-Morse pumps; fuel capacity 41,500 gals.

AN Enterprise Diesel, 8 cylinder 10½ x 12, 400 hp., will power the new 100-ft. tuna clipper by Hodgson-Greene-Haldeman, Long Beach, California, for unnamed owners. Auxiliaries are three Caterpillar Diesel 30 kw. generating sets; pumps and motors are by Fairbanks-Morse.

THE same Long Beach yard is also building a Type YP refrigerated ship for the Navy. The main engine is a Union 750 hp. Diesel, auxiliaries being of the same make. Tonnage is 650.

POWERED with a 875 hp., 5 cylinder 16 x 20, Fairbanks-Morse Diesel, several of the new 148-ft. Army transport supply vessels are under construction in Pacific Coast yards. Auxiliaries and generators are also F-M, engine Vibro Isolators are Korfund and batteries are Exides.

AT Astoria, Oregon, the Columbia River Boat Building Co., are installing a 125-hp. Cummins Diesel in a 49-ft. combination fishing boat for Eric Lindeman.

ANOTHER Oregon built fishing boat is nearing completion at the Otis yards of the Calkins Boat Works. *Dare II* is 52 feet and has a 100 hp. Buda Diesel.

A CUMMINS Diesel is being used to repower the *Oslo*, Berger Edwards' fihserman, by Latta Bros., Seattle, Washington. It's a 150 hp. with supercharger and Twin Disc gears.

AGAIN power scows are coming into prominence. Maritime Shipyards, Seattle, Washington, are turning out a group of 84-footers all engined with 100 hp. Buda Diesels.

AND to prove we are going to report these Diesel installations regardless of size, John Hawkins, Coos Bay, Oregon, will install a 40 hp. Gray Marine Diesel in his new 65-ft. schooner by Hillstrom Co.

TWO more Gray Diesels will be installed at Eureka, California, by Hallmark and Hubbard in fishboats building. They are 6 cylinder, 165 hp., with Twin Disc gears.

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During the past 25 years millions of AUTO-DIESEL "Ladle Tempered" Piston Rings have been used as original equipment and replacement for stationary and mobile units and for hydraulic and pneumatic operated industrial equipment. The high standard of quality maintained down through the years is responsible for the large number of firms that have standardized on AUTO-DIESEL Piston Rings for so many years. We shall always maintain this high quality.

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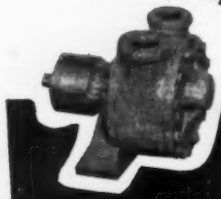

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West Coast Diesel News

REPOWERING of *Pabco*, Berkeley Transportation Company's San Francisco Bay tug is being done with a Gray Diesel of 165 hp. with Twin Disc gears by Thompson Machine Works, San Francisco, California.

A CATERPILLAR Marine Diesel has been selected by Hunt Marine Service, Richmond, California, for a stock "Pup" purse seiner they are building. The engine is 115 hp. with 2-to-1 Twin Disc gears.

ANOTHER Caterpillar Marine Diesel is being installed as a repower job on Grimes Packing Co.'s 60-ft. *Oregon Wolf*. Lester and Franck, Seattle, Washington, are setting up the 150 hp. engine complete with Twin Disc gears.

THE first of two Stockton, California, all-steel tuna clippers of 140 ft. will soon come off the ways of Clyde Wood, Inc. for Capt. Matt Monise, San Diego. Main engine is a supercharged 850 hp. Washington Diesel. Auxiliaries are Union Diesels.

CONSOLIDATED Shipbuilding Co., Los Angeles, California, will install a pair of 400 hp. Enterprise Diesels in the 140-ft. clipper for Capt. Bill Kessig.

SOMETHING new is the all-electric driven auxiliary installation on the new Dragich seiner by the Harbor Boat Builders, Terminal Island, California. All deck machinery, pumps, compressors, etc., are d.c. current driven from 40 kw. generators direct connected to a pair of 62-hp. Superior Diesels.

ANOTHER Superior Diesel installation has been placed in the 75-ft. *St. Mary*. An all-steel bait boat, the refrigeration has been changed over to brine requiring a larger engine—100 hp. and 50 kw. generator.

THE 54-ft. steel, refrigerated fishing vessel building by Crofton of San Diego, California, will be powered with twin Gray Diesels of 165 hp. with Twin Disc reduction gears. There will be three General Motors 60 hp. auxiliary Diesels.

DOMINIC LaBRUZZI'S new 50-ft. trawl boat building by Master Builders, Alameda, California, has a 115 hp. Caterpillar marine Diesel from Thos. A. Short Co., San Francisco distributors.

A new repower job on the Columbia River is that of the Portland Tug Co.'s towboat

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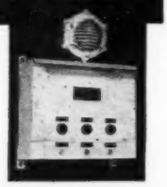

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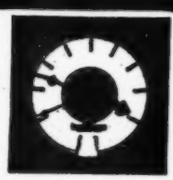

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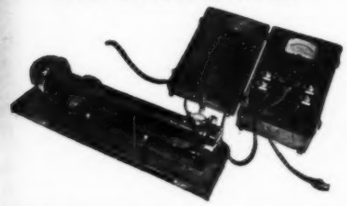

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West Coast Diesel News

Hulda with a 320 hp. Fairbanks-Morse Diesel.

UP on the Mackenzie River at Fort Norman, Yukon, the 84-ft. *George M. Askew* powered with a 135 hp. Caterpillar Diesel starts for Northern Trans. Co.

Willis F. Tiemann Appointed Assistant Works Manager

THE Superior Engine Division of the National Supply Company announces the appointment of Willis F. Tiemann as Assistant Works Manager of the Springfield, Ohio plant.

Willis F. Tiemann

Mr. Tiemann has been identified with the manufacture and installation of Diesel engines for nearly thirty years. He has been with Superior since 1933, holding the positions of Foreman, Supt. of Assembly, Plant Superintendent and General Plant Superintendent prior to his recent promotion to Assistant Works Manager.

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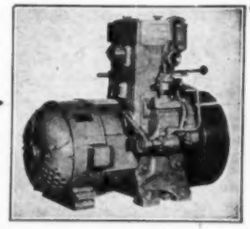

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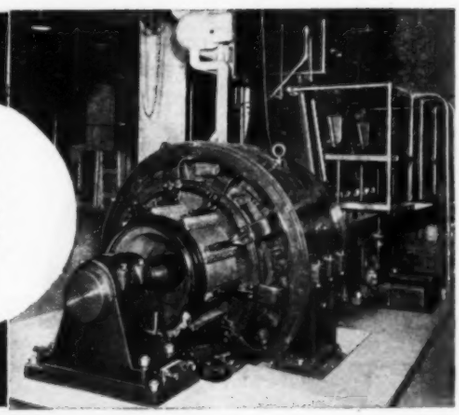

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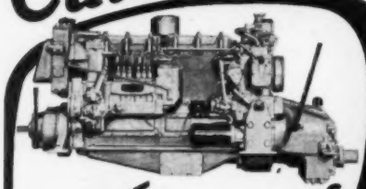

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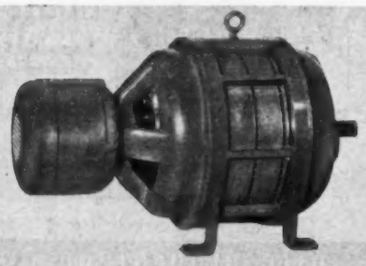

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